7 STEPS TO QUICK & EASY WING REPAIR *p. 88*

MODEL Airplane NEWS

75th ANNIVERSARY 1929-2004

FLY LIKE A PRO!

TOP PILOTS TELL ALL

SEE IT HERE FIRST!

Hangar 9's Giant **Edge 540**

Super Saito 82

THE LATEST 4-STROKE

WE TEST

Great Planes **Super Stearman** › Scale classic

Sig **Four-Star 40** › ARF all-time favorite

Trick R/C **Zagi-XS** › Hotshot flying wing

MS Composit **Hornet II** › Micro heli

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NOVEMBER 2004

MODEL AIRPLANE NEWS 75th ANNIVERSARY 1929-2004

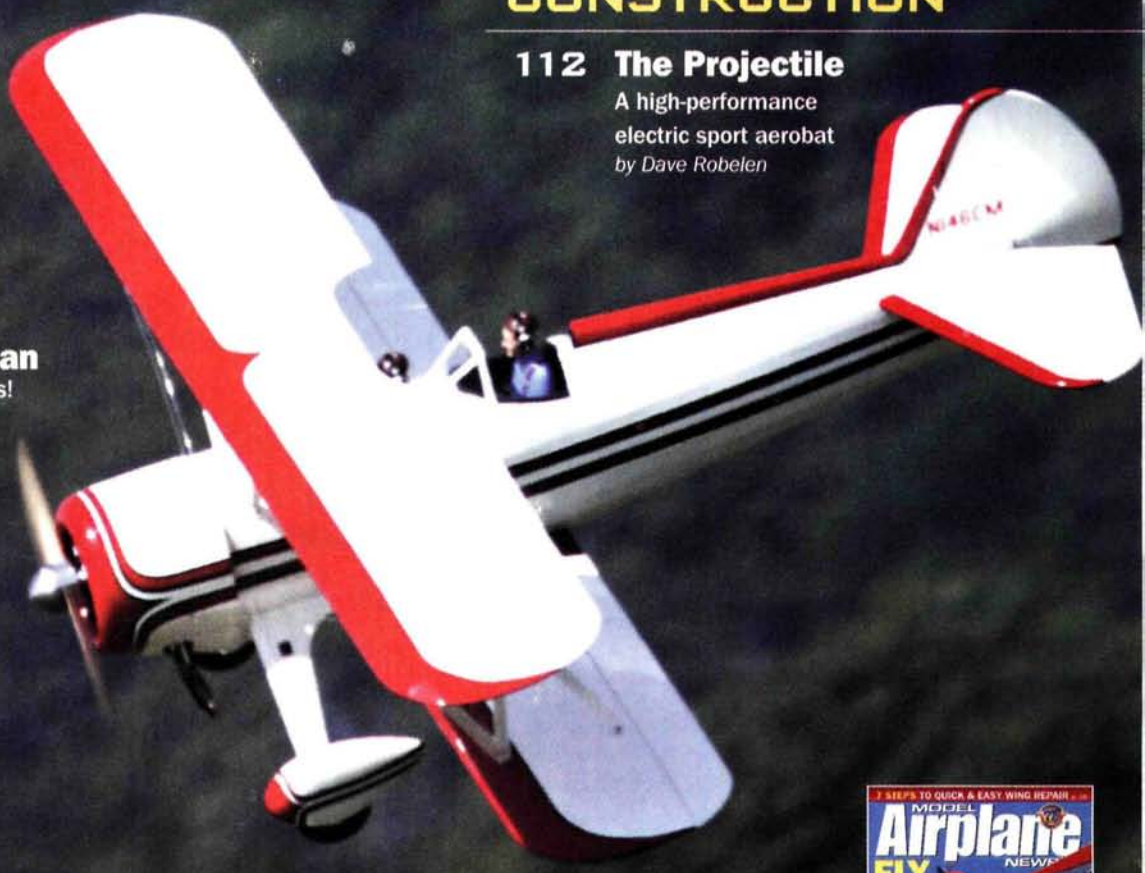
Model Airplane NEWS

NOVEMBER 2004, VOLUME 132, NUMBER 11

FLIGHT TESTS

FEATURES

CONSTRUCTION



***ON THE COVER:** our West Coast associate editor John Reid built and test-flew the very first Hangar 9 Edge 540 in the country! See how it performed in his review on page 42. (Photo by John Reid.) ON THIS PAGE: the Great Planes Super Stearman is a dazzling ARF rendition of a classic airplane. Stan Kulesa reviews it on page 80. (Photo by Pete Hall).*

COLUMNS

DEPARTMENTS

EDITORIAL

BY DEBRA CLEGHORN

IT'S SHOWTIME!

When it comes to all-out flying, RC planes are at the head of the class: RC fliers can perform maneuvers that pilots of full-size planes wouldn't even dare to attempt! Expert RC pilots can make their aircraft do seemingly impossible maneuvers while the audience catches its collective breath. How do they do it? Here's a hint: they don't practice from dawn to dusk. From how they set up their models to how they tweak their radios to their aircraft preferences, the top dogs of RC share their inside secrets in our "It's Showtime" feature. Who prefers coreless servos to digital? Who likes to keep his radio programming as simple as possible? The answers to these questions—and more!—start on page 32.

When it comes to true showstoppers, it's hard to beat a big (really big!) aerobatic biplane like Hangar 9's new, 33-percent Edge 540. With a 97.5-inch wingspan and 1,730.6 square inches of wing area, this high-powered performer is designed for unlimited action. We teamed up with the folks at Horizon to offer an exclusive first look at this big aerobat, so our West Coast associate editor John Reid assembled and flew the very first production model in the country! We're thrilled to offer an inside look at this incredible flying machine; see page 42 for all the details, and don't miss our video Click Trip at modelairplanenews.com.

This month, we also assemble and test-fly the beautiful Great Planes Super Stearman (first seen on the cover of our August 2004 special *Buyers' Guide* issue), the ARF version of the well-loved Sig Four-Star .40 and the latest foamie flying wing from Trick R/C: the Zagi-XS. We round out this issue with a look at an innovative micro-helicopter: the MS Composite Hornet II.

Our scratch-building readers are sure to love this month's featured construction article from master modeler Dave Robelen. Reminiscent of a '60s pattern ship, the 42-inch-span Projectile is powered by an electric brushless motor and can fly at speeds of up to 50mph yet is responsive enough to be flown in a fairly small area. This aerobatic design features all-balsa and ply construction and straightforward building techniques.

Until next time—safe landings!

Debra Cleghorn

Debra Cleghorn
Executive Editor

JOIN OUR TEAM!

Do you enjoy your job as much as you enjoy your hobby? If you don't, put your passion for modeling to work by joining our editorial team! Owing to our successful and expanding line of RC publications, we're looking for a creative, organized, quality-driven individual to work on *Model Airplane News*, *Backyard Flyer* and *RC MicroFlight*. This full-time, Connecticut-based position requires writing and editing experience and, ideally, significant knowledge of the RC hobby. You must be able to work under deadline pressure and thrive in a results-oriented team environment.

We offer a competitive salary and excellent benefits, including a 401(K) plan. Send cover letter, resume and salary requirements to: Director, Human Resources, Air Age Media, 100 East Ridge, Ridgefield, CT 06877-4606 USA; fax (203) 894-3694; email resumes@airage.com.

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WRITE TO US! We welcome your comments and suggestions. Letters should be addressed to "Airwaves," *Model Airplane News*, 100 East Ridge, Ridgefield, CT 06877-4606 USA; email man@airage.com. Letters may be edited for clarity and brevity. We regret that, owing to the tremendous numbers of letters we receive, we cannot respond to every one.

MUSTANG FEVER

Your review of the Top Flite giant-scale P-51D Mustang ARF could not have come at a better time! Ever since its introduction, I have coveted this warbird! I have built a number of smaller Mustangs and wanted to move to a giant-scale P-51. I read with interest about your engine-box modification, but I wonder whether it is absolutely necessary. Couldn't I simply add a spacer between the firewall and my engine to position it correctly? Thanks again for a great review; your flight shots are awesome!

Ronald Elkins
[email]

Ronald, thanks for your words of encouragement; flying and reviewing the new Top Flite Mustang ARF was both fun and challenging. Staff photographer Deron Neblett gets all the credit as shutterbug!

Depending on which engine you use, you can most likely install it by adding a spacer between it and the stock firewall. The main reason I chose to add a full-length engine-box structure was because of the ZDZ 40RV-L's rear-mounted carb. With a side-mounted carb, stacking several layers of ¼-inch plywood would be a simpler way to properly space the engine. The proper firewall-to-spinner distance is between 7½ to 7¾ inches. Good luck with your "Big Beautiful Doll"! GY

GEE BEE MODEL-A

Henry Haffke was kind enough to send me your magazine containing the Gee Bee Model-A biplane construction article. I am the daughter of Z.D. (Granny) Granville, the designer of this aircraft. Since it was not a run-of-the-mill biplane but had a number of innovative improvements, I though you might be interested to know about them.

My father conceived of the changes by observing the damage incurred when planes had to make emergency landings, such as in a cornfield. He envisioned ways to alter the construction to prevent the severe structural damage during these landings. The rudder, flippers (elevators), stabilizers, wing panels and struts were all interchangeable. The tailskid could be replaced by a tailwheel that swiveled 360 degrees and had a flat spot on the cam that locked it straight forward for takeoffs and landings. The plane weighed 850 pounds and held two people seated side by side instead of the more conventional tandem arrangement. The idea behind this was to foster better communication between the pilot and his passenger (who was often a student).

My father constructed an Oleo landing gear with hydraulic shock absorbers that were more flexible than those used previously. They were attached to the plane in such a way that in the event of a hard landing, severe structural damage to the fuselage was avoided because the landing gear prevented bouncing. He also designed an overhead control system, which positioned the control stick so that it protruded from beneath the instrument panel instead of coming up from the floorboards between the pilot's legs. It provided dual control and featured a release mechanism to return control to the pilot in the event the student froze on the stick. The foot pedal and rudder controls on the passenger side folded back and dropped into a little compartment when not in use. Perhaps the most ingenious invention was the flap/aileron combination that he placed on the top wing. It aided in making the plane fly slower for safer landings, and it could be adjusted while in flight to add 4 to 5mph to the cruising airspeed. This concept is used on almost all planes today.

For all of these reasons, this was a unique plane. I thought you and your readers would be interested to know this.

Norma B. Granville, MD
Windsor, CT

Dr. Granville, thank you so much for providing such wonderful information about the Gee Bee Model-A biplane. Henry Haffke's construction articles have always been of great interest to Model Airplane News *readers. Granny was indeed ahead of his time, and your personal insights are most welcome. Thank you for taking the time to share your father's innovations with with us.* *GY*

HOOKED ON SMOKE

I just love seeing big, gasoline-powered models with smoke systems; that fluffy white smoke trail is a real showstopper. I know that big gas engines have very hot exhausts and, therefore, make the best smoke, but could you give me some pointers on installing a smoke system in a small, 4-stroke-powered biplane? Thanks!

Michael Wheeler
[email]

Michael, the secret to producing gobs of fluffy white smoke is heat: the hotter the exhaust temperature, the better! Second only to gasoline engines, 4-stroke, glow-powered engines have very high exhaust temps, so with a little setup effort, you can make a 4-stroke engine smoke with the best of them! First, you'll need a smoke-pump system (refer to the "Smoke System Guide" in our December 2003 issue) and then, depending on your engine, you'll need an aftermarket smoke muffler. Start by finding one that best fits your model. I have had good results with Slimline's smoke mufflers, but if one is not available for your engine, you can make one yourself.

The trick is to preheat the smoke fluid before you introduce it into the engine's exhaust. Do this by installing a metal-tube coil either inside the muffler body or by wrapping the coil around the steel header pipe. This should be brazed to hold it securely and to maximize the heat transfer. It's also important to regulate how much fluid is pumped into the muffler; too much will cool down the muffler and decrease the volume of smoke. I use an onboard needle-valve assembly and install it in such a way that I can tweak the setting while the engine is running! Using just enough fluid to produce plumes of smoke will extend your "smoke-on" time. Check my "Thinking Big" column entitled "Big Smoke for Big Birds" in the November 2000 issue. Hope this helps! *GY +*

TIPS & TRICKS

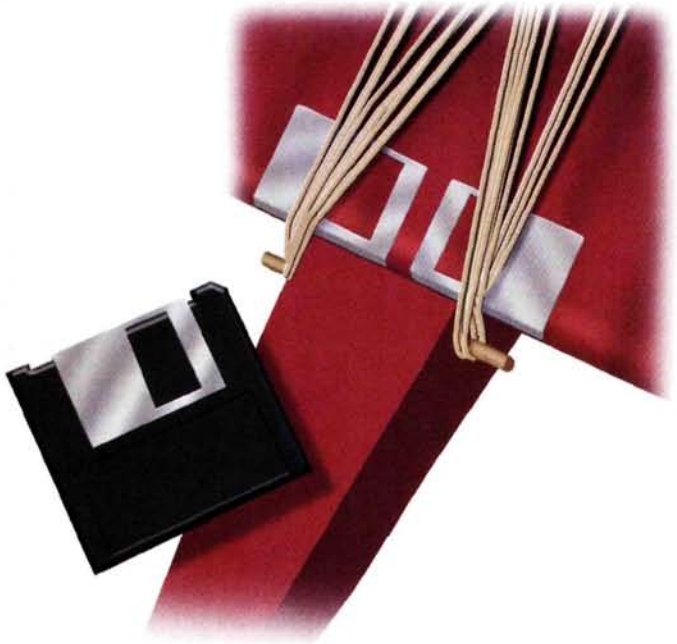
Illustrations by Richard Thompson

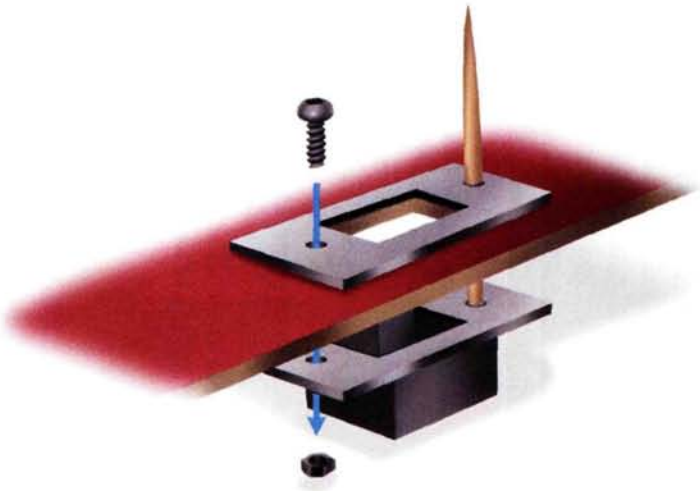
SEND IN YOUR IDEAS. *Model Airplane News* will give a free, one-year subscription (or a one-year renewal, if you already subscribe) for each idea used in "Tips & Tricks." Send a rough sketch to *Model Airplane News*, 100 East Ridge, Ridgefield, CT 06877-4606 USA. BE SURE THAT YOUR NAME AND ADDRESS ARE CLEARLY PRINTED ON EACH SKETCH, PHOTO AND NOTE YOU SUBMIT. Because of the number of ideas we receive, we can neither acknowledge each one nor return unused material.

floppy reinforcement

A lot of planes still use rubber bands to hold the wing in place. To make sure that the wing stays put, the rubber bands must be tight, but this can crush the wing's trailing edge. Before you throw away old 3½-inch floppy discs, remove the plastic or thin-metal slide. It makes an excellent trailing-edge protector and weighs almost nothing. Use it as is, or trim it to suit your needs.

Carmelo Nunno, Owen Sound, Ontario, Canada





simple third hand

Sometimes it can be difficult to install the radio's on/off switch in the confines of a fuselage that has too little space. To hold the switch in place while you work on it, here's a simple and effective "third hand." After you've used the switchplate to drill the mounting holes and slide-switch opening, place the switch in the fuselage and insert a round toothpick through the plate and into the switch. The toothpick will hold the switch in place so you can thread and tighten the other screw.

E.W. Iversen, Bowling Green, KY

make mine a double

Modelers really take to heart the phrase, "Necessity is the mother of invention," and they are always on the lookout for unusual objects that can serve as tools. For example, at one time or another, we've all needed something round of a specific diameter to wrap sandpaper around to help us shape that perfectly round hole. Have you ever noticed that a shot glass is tapered and perfectly round? Wrap a length of sandpaper around it, and you'll have a tool that can smooth the edges of holes of various sizes. It works great on small cowls (like those found on park-flyer-type models). Use a larger, tapered glass for the bigger holes.

Joe Kazakavage, Sebastian, FL

no sparks here

Before each flying session, it's important to check your receiver and transmitters to see whether they're up to par. Many modelers use an expanded-scale voltmeter to check them, but if you allow the leads to accidentally touch each other, you could short out the batteries. To prevent this, shorten one of the meter's leads; this will make it very difficult (if not impossible) for the leads to touch each other.

Harold Nance, Lesage, WV ✈

PILOT PROJECTS

SEND IN YOUR SNAPSHOTS. *Model Airplane News* is your magazine and, as always, we encourage reader participation. In "Pilot Projects," we feature pictures from you—our readers. Both color slides and color prints are acceptable, but please do not send digital printouts or Polaroid prints. Emailed submissions must be at least 300dpi. We receive so many photographs that we are unable to return them. All photos used in this section will be eligible for a grand prize of $500, to be awarded at the end of the year. The winner will be chosen from all entries published, so get a photo or two, plus a brief description, and send them in! Send those pictures to "Pilot Projects," *Model Airplane News*, 100 East Ridge, Ridgefield, CT 06877-4606 USA.

P-51 Mustang

Greg Minden

Las Vegas, NV

This showstopper comes all the way from Las Vegas! It started out as a .60-size Hangar 9 ARF, and Greg turned it into a .91-size beauty. He powers the Mustang with a Y.S. engine, and the plane flies great with it. Look at that dazzling finish! For that super-sharp covering job, he used chrome UltraCote and Flite-Metal on the gear doors and cowl. Greg also relocated the tailwheel for a more scale look, and he installed Spring-Air retracts. Great job, Greg.

Phaeton 90

John Roenfeldt

Littleton, CO

This is John's first attempt at kit building, but you would never guess it. His 70-inch Balsa USA Phaeton 90 biplane weighs 10½ pounds, is powered by a Saito .91 engine and uses a Futaba 6DA radio for guidance. With its modified fuselage, struts and tail feathers, the Phaeton looks great in its UltraCote covering. Beautiful plane, John; keep up the good work!

Ford Tri-Motor

Don Heinzerling

Port Clinton, OH

Although Don's Ford Tri-Motor doesn't fly, it's safe to say that this scratch-built beauty looks as though it could. Made out of scrap wood, the Tri-Motor's three-piece wing is formed from construction grade spruce with a span of 8 feet, 9 inches. It weighs 53 pounds and is skinned in ⅛-inch lauan mahogany paneling. This massive model was built with a complete cockpit, 22 seats, a functional door, instruments, two walnut steering wheels turned on a lathe, three motors and a metal exhaust (made of copper tubes sweat-soldered together). That great-looking finish was created from 0.017 corrugated aluminum. No wonder it took Don 21 months to finish! If you think this was a crazy project, listen up: Don plans to build another Ford with an 11-foot wingspan! You go, Don!

Cessna 140

Don Preister

Lake City, MI

Built from a Jack Stafford kit, Don's Cessna is quite a sight. This model is built to ¼ scale and has a 98-inch wingspan. Trimmed to duplicate his full-size 1946 Cessna 140, Don's model weighs only 18 pounds. He powers it with a Saito 1.50 engine and an 18x6 prop. The balsa-sheeted and lightweight fiberglass fuselage has a beautiful Coverite finish. Don tells us that his model "... flies great with a Futaba 9CAP transmitter and receiver and Hitec servos." Terrific model.

AIR SCOOP

by the Model Airplane News *crew*

NEW PRODUCTS hit the model airplane market all the time, so here's the inside source for what's hot and where you can get it. For every issue, we sift through product announcements, show reports, rumors and prototypes to let you in on the best and the latest. Remember, you saw it here first!

WATTAGE
Decathlon 370EP ARF

This sweet little flyer is guaranteed to fly just as well as its nice looks lead us to expect because the engineers at WattAge have updated a popular design with an even lighter, stronger airframe and a new covering scheme. In addition to its light, built-up fuselage and one-piece wing, the Decathlon 370 features a scale molded cowl and wheel pants, aluminum landing gear, adjustable micro-pushrods and two motor-mount options to accommodate a WattAge 370 power system or a small brushless motor. With a price tag of just $70, this full-house flyer is sure to be another winner for WattAge. Specs: wingspan—28.75 in.; wing area—151 sq. in.; length—24.25 in.; weight—14 to 15 oz.; radio req'd—4-channel.

WattAge; distributed by Global Hobby Distributors; (714) 693-0329; globalhobby.com.

HANGAR 9
P-51D MISS AMERICA

Surely one of the most recognizable airplanes in the world, this Reno Racer is now available in a .60 version. Displaying the high quality and attention to detail for which Hangar 9 is known, this ARF even comes with installed, retractable landing gear.

Miss America's performance matches its extraordinary appearance. It can rip and bank like any nimble .60 sport plane, easily handling full-throttle loops, hard turns, low-level passes and high-G maneuvers. Specs: wingspan—65.5 in.; length—55.75 in.; wing area—754 sq. in.; weight—7 to 8.5 lb.

Hangar 9; distributed by Horizon Hobby Inc. (217) 352-1913; horizonhobby.com.

HOBBICO
SUKHOI

This .60 ARF is ready to put on a show and can be assembled in about 20 hours. It comes with a dummy radial engine, a painted-fiberglass cowl and molded-plastic wheel pants. Its large control surfaces and dual aileron servos offer more maneuvering power, and its steerable tailwheel makes ground handling a breeze. It requires a .50 to .75 2-stroke or a .70 to .91 4-stroke and a 4-channel radio with standard servos; that's all the muscle this Sukhoi needs to do dazzling aerobatics. Specs: wingspan—61 in.; wing area—708 sq. in.; weight—7.5 to 8.5 lb.; wing loading—24 to 28 oz./sq. ft.

Hobbico; distributed by Great Planes Model Distributors (217) 398-6300; (800) 682-8948; hobbico.com.

EXPERIMENTAL AIRCRAFT MODELS

Challenger II

This 75-inch-span, 1/5-scale ARF is one of a kind. The .46-powered model sports a fiberglass fuselage and wheel pants and Oracover-covered wing and tail feathers, and it comes with Du-Bro and Sullivan add-ins. The high wing can be clipped so you can choose a wing loading of 21 or 25 ounces per square foot. The Challenger II is an ideal candidate for electric and float conversions.

Experimental Aircraft Models (800) 297-1707; rchomebuilts.com.

EAGLE TREE SYSTEMS

Seagull System

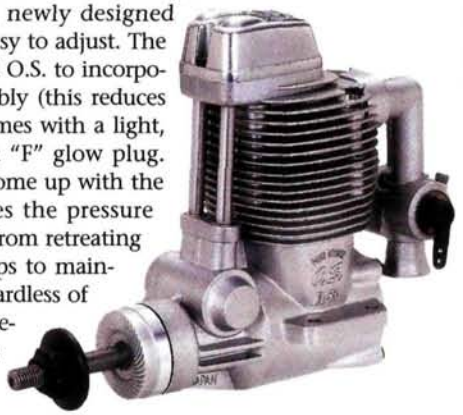
Have you ever wondered how fast your plane travels or how well its power system and servos work? Check out this small, LCD telemetry receiver; attach it to your radio for fully programmable visible feedback and audible alarms. You won't need to tote a laptop computer to the field. In real time, the Seagull transmits up to 16 channels of telemetry data: altitude, climb rate, temperature, rpm, speed, amps, volts, G-force, servo movements, mAh and more! It's available for $150 as an accessory for Eagle Tree's recorder products and as a complete system.

Eagle Tree Systems (425) 484-4131; eagletreesystems.com.

O.S. ENGINES

FL-70 4-STROKE

Want the power and realistic sound of a 4-stroke engine but think they're too expensive? Think again! The new FL-70 costs just $220! In addition to the high-quality components and construction for which O.S. engines are known, the FL-70 features a sealed front bearing to prevent oil from leaking and a newly designed 60W air-bleed carburetor that's easy to adjust. The FL-70 is also the first engine from O.S. to incorporate a ringless piston/liner assembly (this reduces the need for maintenance). It comes with a light, compact F-4030 muffler and an "F" glow plug. The engineers at O.S. have also come up with the Aeropressure system, which uses the pressure from the muffler to prevent fuel from retreating back into the fuel tank. This helps to maintain a consistent fuel delivery regardless of the plane's attitude. Specs: displacement—0.699ci; bore—1.09 in.; stroke—0.748 in.; practical rpm—2,300 to 12,000; weight—6.5 oz.



O.S. Engines; distributed by Great Planes Model Distributors (217) 398-6300; (800) 682-8948; osengines.com.

MULTIPLEX

SYNTHESIZER RF MODULE

If you own a Royal Evo transmitter, you'll want the new synthesizer radio-frequency transmitter module so you'll be able to select the frequency you want to fly on. This isn't like other transmitter modules; they require that you pull them out and adjust tiny dials to set your frequency. With the Royal Evo, you adjust the frequency by holding down the setup key, turning the transmitter on, dialing in the frequency and restarting the transmitter. You now have a transmitter for any allowed frequency. The Synthesizer RF Module costs $140.

Multiplex; distributed by Hitec RCD Inc. (858) 748-6948; hitecrcd.com.

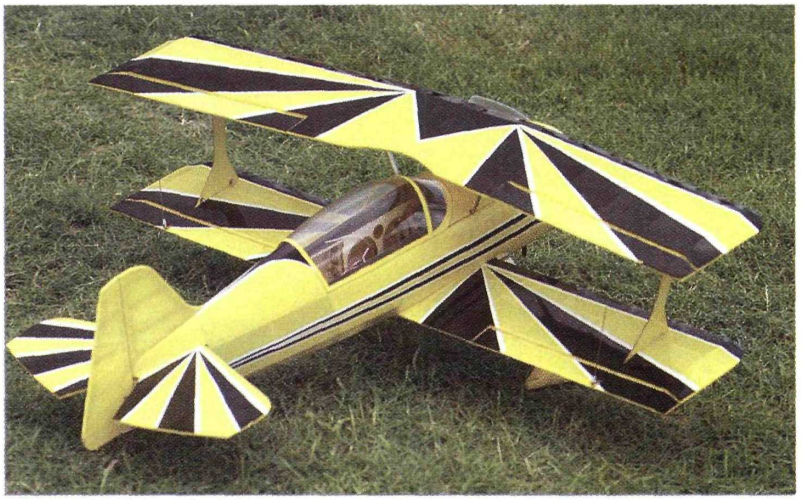
SIG MFG.

Sun Dancer ARF

You've been waiting for it, and at last, it's available! This beautiful aerobatic bipe features precise balsa-and-ply construction and a smooth Oracover film covering. With a 3.2 gas engine and a competition radio, the Sun Dancer will rewrite the book on aerobatics: rock-solid knife-edges, loops (big and small) and snap rolls all the way to eternity. It comes with a painted fiberglass cowl and wheel pants, a pull-pull rudder assembly, heavy-duty control hardware, a twin elevator and aileron mounts, a scale tailwheel assembly, duralumin landing gear, a 24-ounce fuel tank, a heavy-duty hardware package and an illustrated assembly manual. Specs: wingspan—72.1 in.; wing area—1,702 sq. in.; length—66 in.; weight—16 to 18 lb.; radio req'd—4-channel with 8 servos.

The Sig Sun Dancer costs $400.

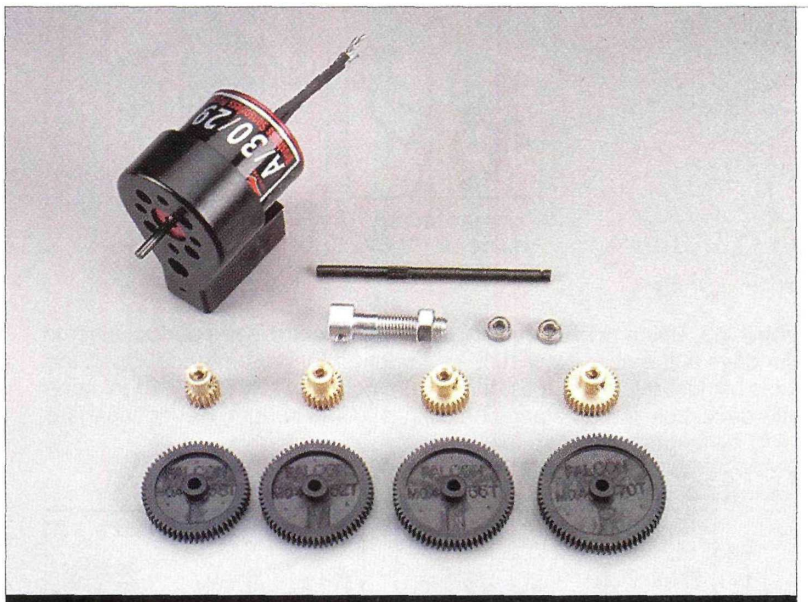
Sig Mfg. Co. (641) 623-5154; sigmfg.com.



AEROLOCK MODELS
PITTS M12

Here's an out-of-the-ordinary Pitts biplane that's designed to fly aerobatics like its full-scale counterpart. Its laser-cut, interlocking, high-quality balsa parts make it almost impossible to build it "out of square," and it gets you into the air fast. The kit also features high-quality hardware. A Hacker B20, Hobby Lobby Axi 2808 Razor 2 or a similar motor is recommended; it also requires an 8- or 9-cell NiMH pack or a 3-cell, 2100mAh Li-poly pack. Specs: wingspans (upper/lower)—33/31.5 in.; wing area—387 sq. in.; length—30 in.; weight—22 to 26 oz.; radio req'd—4-channel with 4 microservos. The Pitts M12 kit costs $100.

Aerolock Models (229) 400-3993; aerolockmodels.com.



ULTRAFLY
n/30 BRUSHLGSS TT1OTORS

These brushless, sensorless high-torque outrunner motors deliver big power at lower temperatures, and each includes a gearbox with four gear sets. The result? Amazing park flyer performance! The A/30 motors will fly 10.5- to 32-ounce models, and they feature ball bearings and a heavy-duty frame for easy, secure mounting. The A/30 29-turn motor is a replacement for the Speed 400 and offers longer run times; the 24-turn motor is a great choice for all-out speed and performance. Specs: length—1.67 in.; diameter—1.08 in.; weight—1.9 oz. plus 0.6-oz. gearbox; price—$99.

Ultrafly; distributed by Great Planes Model Distributors (217) 398-6300; (800) 682-8948; greatplanes.com.

TAKARA
P-47 DESKTOP FLUER

One of the Takara Desktop Flyer Ace Legend Collection, this 1:100 P-47 Thunderbolt is sure to grab your attention. Priced at $14.99, this finely detailed, accurately painted, WW II fighter has a 5-inch wingspan and comes with a display base. When you flip the propeller or push the appropriate button, you hear an engine start-up rumble and then several seconds of authentic engine noise while the prop spins. Close your eyes, and you can imagine this fighter making high-speed, low-level passes as its mighty radial engine generates its unmistakable "music."

Also in the Legend Collection are an F4U Corsair, a Sopwith Camel and a Fokker D-VII—all with authentic engine sounds.

Takara; takara-usa.com.

FMA DIRECT
KOKAM SUPER HIGH DISCHARGE LI-POLYS

Electric enthusiasts appreciate light, high-capacity Li-poly cells, and now they are even better. A single Kokam Super High Discharge (SHD) Li-poly can provide up to 42 amps continuous output! Available from FMA Direct, Kokam SHD cells are offered in 2-cell (7.4V) and 3-cell (11.IV) packs. Continuous current from a 2000mAh pack is 30 amps (15C), while a 2100mAh pack is rated at 42 amps continuous output (20C).

FMA Direct takes a unique systems approach to Li-poly power for RC applications. Packs plug directly into FMA's serial and parallel Interconnection Modules. This approach eliminates the need for soldering and allows packs to be reconfigured easily to suit a variety of applications.

FMA Direct (800) 343-2934; (301) 668-4280; fmadirect.com. ±

TURBINE-POWERED SCALE JETS

Name: Terry Nitsch
From: Grove City, OH
Occupation: engineer
Years in RC: **43**

Q: What are you most proud of?
A: That's an easy one. I am most proud of all my major scale competition wins. I have won six U.S. Scale Master competitions and have won seven times at Top Gun—that's more than anyone else has won.

Q: What, in your opinion, would be the perfect airplane?
A: For me, the perfect plane would be equipped with tricycle landing gear for good ground handling; it would have a medium to medium-heavy wing loading for smoother flight performance and predictable landings; it would have to be somewhat large—somewhere in the 60- to 80-inch-span range and be over- rather than under-powered. The perfect plane also has to be easy to see; its paint scheme should allow easy in-flight visual orientation. And to top it all off, it should have several mechanical options for scale competition, such as bomb drops, droppable fuel tanks, flaps or twin engines, etc.

Q: How much practice time do you devote to the hobby?
A: With jets, I try to fly twice a week every week throughout the flying season. Then to prepare for an upcoming event, I also fly a minimum of two practice sessions the week prior to the event.

Q: What do you think is the most important aspect of setting up a model?
A: Keeping it simple and making sure that everything works reliably. I make sure that every component is installed correctly and leave no margin for error. I usually over-engineer to ensure that it is going to work every time.

Q: How about radio setup?
A: I try to keep it simple. Dialing in the dual rates and expo settings is very important. I set them up so that each of my planes has the same feel; the fewer differences between the models, the better. I use minimal dual-rate percentages and keep all the switch functions in the same places on the transmitter, regardless of the model. Complicated radio setups increase the probability of making a mistake.

"I ALWAYS PLAN FOR MURPHY'S LAW; IF SOMETHING CAN GO WRONG, IT WILL! DON'T TAKE SHORTCUTS, AND DO NOTHING HALFWAY/'

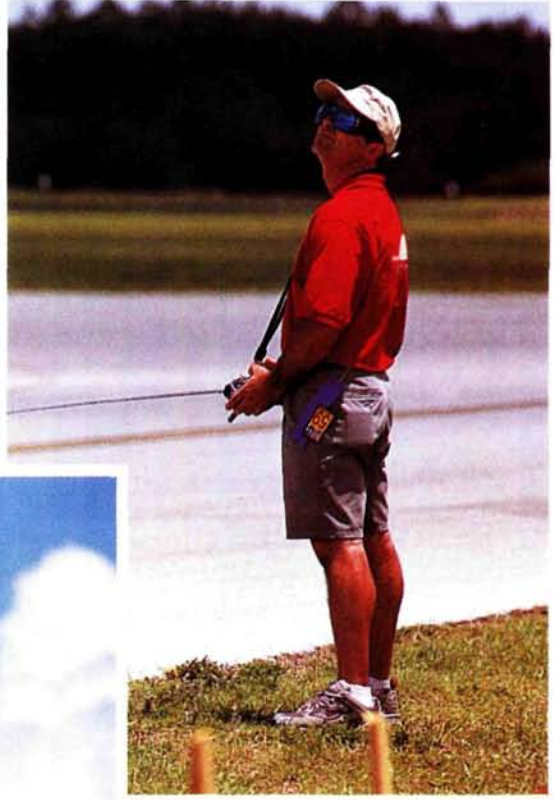
Q: How do you form a fright routine?
A: I look at this as a team effort between the model and myself. I practice and fly a lot so I can figure out what the model does well and what it doesn't do so well. Then I use what I can do best and what the model can do best. Some models roll better than others, so I use that to my advantage. I try to maximize my model's potential as well as my own. I don't want to fight the maneuvers; they should feel natural.

Q: What's your mindset?
A: Before each flight, I discuss what we want to do with my caller—my wife, Sheila. We concentrate on the things we are having trouble with during the maneuvers. We zero in on what we aren't doing well, so I can adjust from round to round to make improvements. I totally depend on her to make sure that all aircraft are accounted for, and I talk to her before I execute each maneuver.

FREESTYLE AEROBATICS

★★★★★★★★★★★★★★★

Name: Quique Somenzini
From: Summerfield, NC
Occupation: model-airplane kit manufacturer; consultant to Horizon Hobby
Years in RC: 27



"MODEL SETUP IS VERY IMPORTANT. IT'S WHAT SEPARATES GOOD FLYING FROM EXCELLENT FLYING."

Q: What are you most proud of?
A: Being the creator of 3D aerobatics. I think it is by far my biggest accomplishment and my biggest contribution to the hobby. I also can't forget my four wins at the Las Vegas Tournament of Champions.

Q: What, in your opinion, would be the perfect airplane?
A: To me, the perfect airplane would be one that followed the pilot's inputs closely with no bad tendencies; one that was predictable at all airspeeds and in all flight attitudes. In other words, one with unlimited performance that's always predictable.

Q: How much practice time do you devote to the hobby?
A: Competition requires a lot of practice time. I would say that the average preparation time for a major competition is around four weeks of flying, three or four flights a day, every day. This doesn't count the time needed to set up the airplane and work out any major engine or control-linkage problems.

Q: What do you think is the most important aspect of setting up a model?
A: To make it fly straight in every attitude and at every airspeed! The more the airplane can fly by itself, the better it is. Remember, when we fly our airplanes, we use our eyes, so the fewer corrections the model needs, the more stable and solid it will fly. By the time we see that a correction is needed, it's too late. This is easy to say but hard to do, and in my experience, it's what takes the most time.

Q: How about radio setup?
A: Mixing is very important. Most airplanes need some kind of mixing, whether rudder to elevator or rudder to aileron, and so forth. This keeps the airplane tracking straight in knife-edge to eliminate unwanted pitch-and-roll coupling. I also like to use flight modes such as normal, rolling circle, spin, snap and landing. I also like throttle-to-elevator mixing for perfect straight vertical downlines.

Q: How do you form a flight routine?
A: Before you can form a flight routine, you first have to determine a model's good points and bad points. I take the airplane for a check-out flight to see how it tracks in the corners and how it performs loops, knife-edge flight, vertical uplines, vertical downlines (45 degrees from inverted) and snaps, spins and stall turns; basically, I fly it in all attitudes and airspeeds. I then check the precision of its maneuvers until I feel it's doing what I want. I then leave the airplane alone for maybe a couple of weeks and go fly other models. After two weeks, I take the airplane up again to see how it flies. If I still like how it flies, it means it's ready for competition.

Q: What's your mindset?
A: Imagination is the main thing. To fly the best that you can, you must be able to "see it" in your mind. For example, when I fly unknown programs during competitions, the first thing I do is look at the program and imagine how my airplane will maneuver through each of the sequences. Once you see the maneuver, then you can easily do it.

PRECISION ELECTRIC AEROBATS

★★★★★★★★★★★★★★★★★★★★

Name: Jason Shulman
From: Tucson, AZ
Occupation: representative for CompositeARF.com
Years in RC: 27

Q: What are you most proud of?
A: Winning the 2004 F3A Pattern Championships in Muncie, IN.

Q: What, in your opinion, would be the perfect airplane?
A: Obviously, a plane that is constructed very light because electrics usually come out a pound or a pound-and-a-half heavier than engine-powered models, so starting with a lighter constructed plane is extremely important. My Composite ARF Impact is a perfect example of this.

Q: How much practice time do you devote to the hobby?
A: I start practicing the sequences for the F3A pattern championships five months before the event. I practice three to four days a week, and each session consists of four flights.

Q: What do you think is the most important aspect of setting up a model?
A: I try to match every airplane's setup to the way I am used to flying, whether it's a small foamie or a large, 40-percent-scale aerobatic plane. That way, I don't have to perform maneuvers differently with each plane; I can make the same thumb movements. The radio should be set up to conform to your flying style. For example, I tend to run a little higher expo than most people do.

Q: How about radio setup?
A: I use a wide variety of mixing, and I try to keep the mixing setups identical for each plane. Dual rates are a must, and I increase my expo percentage for higher-rate settings. As I said earlier, I generally have more expo programmed in than the average pilot.

Q: How do you form a flight routine?
A: In F3A, we fly "Known" and "Unknown" flight routines. The preliminary consists of 23 maneuvers, and the final consists of 19 maneuvers. When flying the Unknowns, we are given four pages of maneuvers to practice, but we don't know the order in which we'll fly them until competition begins. The finalists go through all the various maneuvers to make up the Unknown sequence for the finals.

Q: What's your mindset?
A: To get ready for a flight, I walk away from the pit area and go to the flightline to observe a few pilots ahead of me. I watch how they set things up for their routines. I try to clear my head and just concentrate on the airplanes and the wind conditions by checking the visual cues, such as smoke trails. When I flew an electric model at the Nats, however, I did not have this visual aid! During my flight, I focus on the model and on flying the maneuvers; I rely on my caller to tell me about other situations on the flightline.

"I TRY TO CLEAR MY HEAD AND JUST CONCENTRATE ON THE AIRPLANES."

SCALE COMPETITION

★★★★★★★★★★★★★

Name: Dave Patrick
From: Milford, IL
Occupation: owner/operator of Dave Patrick Models
Years in RC: 37

Dave Patrick (right) and Graeme Mears with their Super Cub at the 2004 Top Gun scale invitational.

Q: What are you most proud of?
A: When I won the 1994 FAI World F3A Pattern competition in Australia. I was part of the Canadian team, and it was awesome to stand on the podium and hear my country's national anthem. I remember being given a bottle of champagne by the U.S. team that had been dominating the competition. It was great!

Q: What, in your opinion, would be the perfect airplane?
A: One that flies well and does what it is supposed to do. Whether it is a Cub or a Mustang, it should be comfortable to control. It shouldn't have any difficulties or bad habits. Its engine should run perfectly, and its setup should work every time.

"WE DO ALL THIS STUFF BECAUSE WE LOVE DOING IT, AND WE'RE HAVING FUN!"

Q: How much practice time do you devote to the hobby?
A: For Top Gun, I block off a solid two weeks of 24/7 flying. Practice sessions are twice a day. The important thing is not to over-practice and not to cram! It's important to have a plan and to practice so you are at your peak just before the contest. Then you must maintain that level of proficiency. Graeme Mears, who builds the greatest scale models, and I have won Top Gun Team Scale three times. We try to have 50 full practice flights done before we arrive at an event. There is no substitute for good practice time. Practice doesn't necessarily make perfect; it just makes the same! You need someone to evaluate your flights for you so you don't perfect flight mistakes. You have to put your ego aside and listen to your trainer/caller. Listen to his observations, and do what he says.

Q: What do you think is the most important aspect of setting up a model?
A: In a nutshell, the most important setup things are proper center-of-gravity position, control-throw quantities and proper installation of linkage and setup. After that, it's all flying.

Q: How about radio setup?
A: It's important to use your radio gear properly. Use mixing for pattern or scale maneuvers, so the airplane does what it's supposed to do. This all depends, of course, on your particular aircraft. With my Futaba radio, I use the "Condition" feature so I can just flip a switch to select an entire model-memory setup. I change modes for 3D maneuvers versus hovering versus slow rolls. You really have to read the radio manual and get the most out of it. Also, use only good-quality, coreless motor servos for quicker response. Digital servos are nice but not really necessary.

Q: How do you form a flight routine?
A: I try to make it specific to the model type. I like to use unusual maneuvers. With our Super Cub, we did a side slip as a maneuver because no one else was doing it, and it looks really cool! Showy moves—ones you can do well and consistently with that airplane—are good for your score. One year, when we were flying the Tiger Moth, we included a snap roll. It impressed everyone, and it was easy to do. It was well within the model's capability.

Q: What's your mindset?
A: At any event, I try to ignore that the judges are watching. When you go to the pilots' station, it can feel as if you're studying with someone looking over your shoulder. You can get nervous. The solution is to be totally focused on making the model do exactly what you want it to do. Concentrate on the perfection of the maneuvers, regardless of the weather conditions. Ignore the pressure, start the engine, and the rest of the world becomes distant.

AEROBATIC HELICOPTER

★★★★★★★★★★★★★★★

Name: Len Sabato
From: Pesotum, IL
Occupation: owner, Helis Plus Inc.; manager, Horizon Hobby's JR Heli division
Years in RC: 35

"I GET AS MUCH ENJOYMENT FROM DESIGNING, BUILDING AND TUNING MY MODELS AS I DO FROM FLYING THEM. IT JUST WOULD NOT BE AS SATISFYING TO FLY A MODEL THAT I DID NOT BUILD MYSELF."

Q: What are you most proud of?
A: Representing the USA by making it onto the USA F3C World Championships Team for Japan 2003.

Q: What, in your opinion, would be the perfect helicopter?
A: My idea of the perfect heli would be one that is easy to assemble and requires extremely low maintenance. It would likely be an electric-powered CCPM model in the 90-size class.

Q: How much practice time do you devote to the hobby?
A: For F3C practice, I generally fly 50 to 60 gallons of fuel per year (more than 350 flights) during the months of May through October.

Q: What do you think is the most important aspect of setting up a model?
A: With helis, the most important thing about setup is to get your engine/muffler/fuel package working as smoothly and consistently as you can and then building your model setup around that. Many engine/muffler combinations work best at a specific rpm. You need to determine at which rpm your engine runs best, and then adjust the cyclic rate, expo setting, etc., until you fine-tune the model to achieve the control feel you want. At the contest level, it's important to get your engine package and radio programming as perfect as you can.

Q: How about radio setup?
A: Because all of the models I fly are of the CCPM variety, I generally begin the setup for a new model by using an established program from a previous model. This helps to give me a good starting base for expo, special program mixes, etc. I then fine-tune the model until it is properly trimmed. If I learn something new in the programming and trimming of the new model, I note the changes that I made to the new program and then apply these changes to my other models to see how they perform.

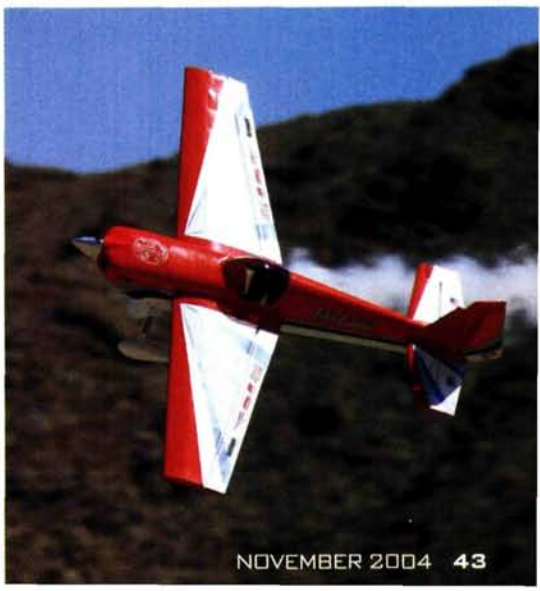
Q: How do you form a flight routine?
A: For FAI, we fly to a set routine that's comprised of two flight schedules (A and B). When I am practicing these routines, I first learn the order of maneuvers using a flight simulator. I then practice each of the schedules from start to finish. I determine which maneuvers I am having difficulty with, and I practice only those maneuvers, working on my execution and sometimes the model setup until I improve. I then fly the schedules from start to finish until I am satisfied with all maneuvers.

Q: What's your mindset?
A: My mindset is, of course, to try to do each maneuver as precisely as I can. I try to concentrate very hard while keeping my adrenaline rush to a minimum. People say that I concentrate so hard that I don't even blink my eyes! You have to compete in a lot of contests to get to a point at which you're as calm as you were during practice. I found that when I learned to stay calm and focused during my flights and not get too keyed up or nervous, I saw the biggest improvements to my flying. Easy to say; pretty hard to do!

HANGAR 9

Edge 540

FIRST LOOK!



BY JOHN REID

Get the competitive edge

I have always been a big fan of the Edge 540, so when Hangar 9 unveiled its newest 33-percent Edge 540 at the last Toledo show, I knew I had to have one. When I was given a chance to review it, I couldn't say "Yes!" fast enough. This plane (like other large aerobatic planes from Hangar 9) was designed by veteran Tournament of Champions (TOC) pilot Mike McConville. The new Edge 540 will satisfy any pilot's need for a stable, fully 3D aerobat.

PHOTOS BY JOHN REID; TEST PILOT: DAVE SULLIVAN

WHAT'S IN THE BOX?

Like other large-scale Hangar 9 kits, the Edge 540 arrived in two large boxes. One contained the balsa/plywood built-up wings and horizontal stabilizers; each component was individually bagged and secured with either packing tape or cardboard filler pieces. The other box contained the balsa/plywood built-up fuselage and rudder housed in separated divided compartments.

Safe data storage

The JR DataSafe Ultra is the perfect companion to the JR 10X transmitter. This data-management system offers you the point-and-click convenience of using your PC to program your JR 10X transmitter. You can transfer data from your transmitter to your computer and from the computer back to the transmitter. Setting up a plane has never been so easy; you can even modify existing programs from other planes to suit the needs of your latest aircraft.

Once I've finished setting up my plane on the PC, I can transfer that data to the transmitter and test all the control functions on the plane. After making little tweaks and corrections on the transmitter, I can transfer that information back to the PC. Now I have a backup copy of my new model's programming. If the programming in the transmitter is corrupted, I can retrieve it from the PC and reinstall it.

As with every new plane, I do a little more tweaking with the radio program during the first couple of flights to get everything dialed in. Once I get back home, I upload the current setup into the DataSafe program and compare it with the earlier version. On a side-by-side comparison screen, each changed item is highlighted in red with a little exclamation point in front of it. When the different fields are selected on one screen, the opposite file moves to approximately the same position so that you can see the difference.

Another advantage of using the DataSafe Ultra is the ease of making a printout of all the programming parameters. Now there is no need to write down every code's data from a model; with the DataSafe Ultra, all I do is click on the print button, and within a minute, I have a complete printout of every setting I've inputted for a given model. I keep this in my flight box in case I need it at the field.

For 10X owners, the DataSafe Ultra will really cut down on your programming time and provide you with a quick way to restore lost data. It's a definite must-have! Price: $299.95.

Dissimilarities between various model function values are highlighted in red in the side-by-side comparison screens.

specifications

MODEL: Edge 540

MANUFACTURER: Hangar 9

DISTRIBUTOR: Horizon Hobby Inc.

TYPE: 1/3-scale aerobat

WINGSPAN: 97.5 in.

LENGTH: 85 in.

WEIGHT: 26 lb.

WING AREA: 1,730.6 sq. in.

WING LOADING: 34.6 oz./sq. ft.

RADIO REQ'D: 4-channel w/8 servos

RADIO USED: JR 10X transmitter w/6 JR DS 8411 servos, 1 JR 537 and 1 JR DS 8611 servo w/2 JR Matchboxes

ENGINE REQ'D: 3.8 to 4.8ci

ENGINE USED: 3W-106B2

PROPS USED: 3W 27x10 and 28x10 w/Tru-Turn spinner

PRICE: $849.99

FEATURES: fuselage is all lite-ply and balsa construction; built-up balsa wings, elevator and rudder; painted fiberglass cowl and wheel pants; heavy-duty, carbon-fiber main gear; clear plastic canopy hatch; metal wing tube; decal sheet; 44-page instruction manual that includes a section on how to do various maneuvers.

COMMENTS: for such a large airplane, the Edge 540 goes together rather quickly. Most of your construction time will be spent installing the radio equipment, smoke system and other peripheral items. This is Hangar 9's lightest 33% aerobatic plane to date, and it is definitely one of its best flyers.

HITS

- Excellent construction.
- Removable wings and stabilizers.
- Manual includes setup and flying tips.

MISSES

- Elevator pushrod opening had to be enlarged for the pushrod arms.

Under the hood

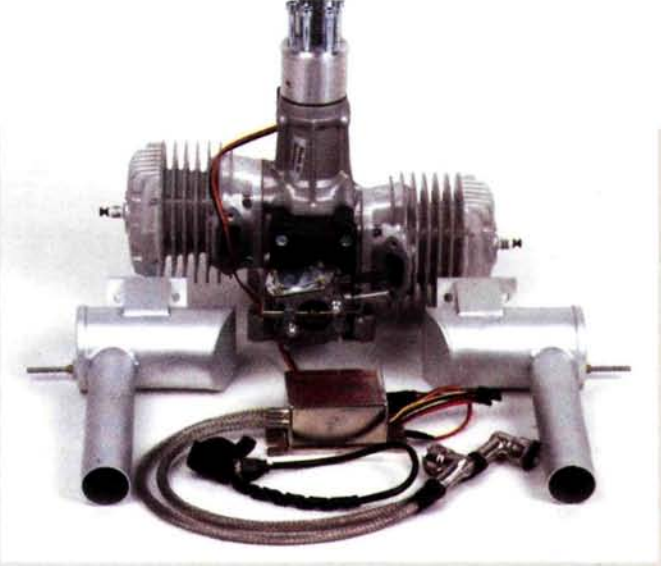
The 3W-106B2 2-cylinder gas engine from Cactus Aviation is an outstanding powerplant for any aircraft in the 33- to 35-percent range. The only things that surprised me more than its power output were its reliability and how easy it is to start.

As recommended by Cactus, I installed the 106B2 on the Edge 540 without bench-running it; I mounted the engine on the plane according to the manufacturer's instructions and then took the plane to the flying field for its first flight. For the initial flight, I set the high-speed needle valve 1¼ turns out from closed and the low-speed needle valve 1½ turns out; both of these settings are recommended by the manufacturer.

I filled the tank, turned on the ignition switch, toggled on the choke and began flipping the prop. After eight flips, the engine coughed to life and then quickly quit. I toggled off the choke, made sure that the throttle was at the low setting and flipped the prop again. After the sixth flip, the engine came alive. It was running a little rich at both the low and high ends—perfect for the first flight. The plane took off with authority, and it was obvious from the moment that it broke ground that this engine had more than enough power for it. The weather was not the best for a first flight; the flying field is roughly 2,800 feet above sea level, and the temperature at takeoff was 102 degrees. That didn't seem to affect the 3W-106B2; it performed extremely well. It had a reliable idle (albeit rich) and enough power to hover the plane at ½ throttle. I felt so comfortable with this engine that I did harriers and torque rolls close to the deck. Because the engine was running a little rich, I leaned the high-end needle a little less than ⅛ turn and the low-end needle about the same.

For the second flight, the engine was still running slightly rich—but what an improvement in performance and power compared with the first flight! This engine performed so well on the second flight that I will probably keep this rich setting until the engine has been fully broken in. The 26-pound plane was able to hover on the deck at slightly less than ½ throttle. Very impressive!

I could not have chosen a better powerplant than the 3W-106B2 engine; it fits my needs and expectations perfectly. This engine has enough power to fly at my field even on the hottest days, and it's remarkably reliable. The next time you're in the market for a gas powerplant for a large aircraft, I highly recommend that you take a look at Cactus Aviation's fine line of 3W engines.



Specs

Cylinder capacity: 106cc
Power rating: 10.3hp
Bore diameter: 1.73 in.
Stroke: 1.26 in.
Weight: 5.9 lb.
Length: 7.5 in.
Width: 11.4 in.
Speed range: 1,200 to 8,500rpm
Crankshaft: 3 ball bearings
Connecting rod: needle bearings on both ends
Oil/gasoline ratio: 1:50 to 1:80 mix
Ignition: 6 volts
Propellers: 26x10, 26x12, 27x10, 28x10, or 30x8 2-blade

All of these components come expertly covered in a bright four-color scheme with Hangar 9 UltraCote covering. A painted fiberglass cowl, wheel pants, carbon-fiber landing gear, plastic smoked canopy, wing and stabilizer tubes, small hardware package, decal sheet and a 44-page manual are also included in the second box. To finish the model, you will have to provide radio gear, a 3.8 to 4.8ci engine, hardware, a smoke system (optional) and a pilot figure. I highly recommend that you buy Hangar 9's complete ⅓-scale hardware package (sold separately for $149.95) because the Edge 540's manual offers precise measurements and detailed instructions for using this hardware, and that makes assembly and set up all that much easier.

CONSTRUCTION

Before I began construction, I had to choose the powerplant I was going to install in this aerobatic beauty. I decided to go with a 3W gas engine from Cactus Aviation because of its outstanding performance, reliability and power. I fly at roughly 3,000 feet above sea level, where summertime temperatures are normally well over 100 degrees, and air density and heat affect the plane's performance. These two factors almost require a larger and more powerful engine to extract the full aerobatic benefits of this plane. I chose the 3W-106B2 because of its power and reliability, but keep in mind that when you select an engine that's more powerful than a kit's manufacturer recommends, you void the warranty. That's not to say that the Edge 540 can't handle the larger powerplant; it can. The pilot just needs to use proper throttle management to avoid putting undue stress on the plane.

I started my construction on the Edge 540 by removing all the wrinkles in the covering with a covering iron. I prefer to use a covering iron rather than a heat gun because it allows precise temperature control, and that prevents excessive shrinking—especially over the multicolored seams. I've sorted all of my hardware, and now I'm ready to begin assembly.

Two batteries are better than one

Larger planes, such as the Hangar 9 Edge 540, require a number of high-torque digital servos (in this case, 8) to produce enough torque to flip this 26-pound plane around in the air. Digital servos often use two or three times as much amperage as analog servos do. Even when everything is working correctly, digital servos require a fair number of amps from the flight pack. Once a load is put on the servos, whether from high alpha aerobatics or from servos that aren't properly aligned with one another, the amp draw increases; this puts more strain on the electrical system. One remedy for this is a dual-receiver or dual-battery setup. Large-scale planes that use 10 or more servos create a large electrical demand on the system. To ease the demand on the system, it's advantageous to divide the plane's radio system in two and use separate receivers.

Essentially, you would have one receiver and battery pack for the left side of the plane and another receiver and battery pack for the right side of the plane. This way, the amp draw going through each receiver would be for only half the servos; in the case of a 10-servo plane, 5 servos for each receiver. Like other 33-percent planes, the Edge 540 doesn't necessarily need dual receivers, but it would benefit from dual battery packs.

HOW IT WORKS

The dual-battery setup has two batteries and two switch harnesses. Each battery is plugged into its own switch harness and then plugged into the receiver. The first battery is plugged into the battery socket, and the second battery is plugged into any available receiver socket. For the system on this plane, I decided to go with Duralite Batteries Plus 1900mAh cells.

Duralite Batteries are lithium-ion (Li-ion) cells that are much lighter than standard Ni-Cd or NiMH cells. They also incorporate their exclusive charge-safe circuitry to prevent improper charging. Because lithium-ion packs produce 7.4 volts nominal and 8.4 volts fully charged, you will need a regulator to reduce the voltage to 6 before it gets to the receiver. Li-ion cells provide more power and longer flight times than NiMH and Ni-Cd cells.

MY SETUP

Both Duralite batteries are connected to switch harnesses mounted on either side of the plane and then to their own voltage regulator and, finally, into different open sockets on the receiver. If one battery fails for any reason, the other will continue to work as if nothing has happened. This will provide enough power to last the entire flight. A dual-battery system also offers longer flight times, especially when you use the Duralite Plus 1900mAh Li-ion cells. When I took the Edge 540 out for its maiden flight, I had the radio on for 40 to 45 minutes before the first flight as I programmed and adjusted the control linkage. I flew the plane for a 10- to 12-minute first flight. I checked the battery voltage with a digital load tester and found the lowest battery had 7.15 volts left with a 1A load. The second flight lasted 12 to 14 minutes and included just about every aerobatic maneuver I could do. This meant that all 8 of the servos really got a workout. After I landed the plane, I checked the battery again with a digital load tester applying a 1A load. The lowest battery was at 7.01 volts—a drop of only 0.14 volt for that rigorous flight!

Because of the dual-battery system, I now have much longer flying sessions on a single charge and peace of mind knowing that if one pack fails, the plane will still respond to my controls.

WING CONSTRUCTION

Like its predecessor, the Extra 330S, the Edge 540 incorporates two servos for each aileron because of its large control-surface area. For this reason, I selected JR DS 8411 digital servos for all of the control surfaces except the rudder because they have powerful torque (155 oz.-in.) and fast transit time (60 degrees in 0.16 second). I used a JR Matchbox on each aileron to make synchronizing the two servos for each control surface much easier. I shrink-tubed a servo extension to every servo and then routed the wires through the wing. After I had screwed in all the servos tightly, I followed the measurements outlined in the manual to position the control horns and pushrods. The ailerons are now hinged to the wing using the Robart hinge points. To prevent flutter and increase the control surfaces' effectiveness, it is extremely important that you seal all hinge gaps on planes of this size. The instructions outline how to use a 3-inch wide strip of UltraCote for this purpose. The strip is folded in half and ironed onto both sides of the bottom hinge line (wing and aileron).

The 3D servo arms, heavy-duty ball links, Pro-Links pushrods and heavy-duty control horns provided in the optional hardware package made aileron installation and setup quite simple. When the servos were centered, I installed all the linkages to connect the servo arm to the control horn. By adjusting the Matchbox and Pro-Links, I was able to get the aileron servos working in unison very quickly.

ELEVATOR AND RUDDER

The horizontal stabilizer is designed to be removed easily to make the Edge 540 easier to transport and assemble at the field. The stabilizer halves plug into two rods that are inserted through the rear of the fuselage. To facilitate removal, the servo is installed inside the stabilizer, so when you remove the elevator, you just have to unplug the servo extension and not mess with the control linkage. After the servo lead has been routed through the exit hole, the servo is screwed into place and centered by being connected to the receiver. The elevator servo arm is now installed; I had to modify the pushrod opening a little to get the servo arm on the servo.

With both control horns in place, I hinged the elevator to the stabilizers using the same procedure as I used for the ailerons, and then I sealed the hinge gap with UltraCote. I centered the servos, hooked up the linkage and adjusted it to the proper length. The stabilizers (with hinged elevators) are slid onto the tubes and secured with a 4-40 bolt screwed into each tube.

I marked the location for the rudder control horn and drilled that out using a 5/32-inch drill bit. I installed the control horn and adjusted it to the proper height; then I made a tailwheel tiller arm out of 1/8-inch plywood and epoxied it to the bottom of the rudder. I then installed the rudder on the fuselage. I used one JR 8611 high-torque servo for the rudder. This servo produces more than enough torque (220 oz.-in.) for positive rudder deflection. Then I moved on to the rest of the fuselage construction.

flight performance

The 3W-106B2 engine provided plenty of power for even the most aggressive vertical maneuvers, and the Edge 540 can pull itself out of a hover with ease. I made sure that the batteries had a full charge and that all the control throws and radio mixes were set up correctly.

TAKEOFF AND LANDING

Even though the 3W-106B2 engine was new and had never been run before, it provided plenty of vertical power for takeoffs. Considering the altitude and air temperature, the engine's performance was outstanding. Takeoff was uneventful, and the plane required minimal rudder correction because of the slight crosswind at the field. The 3W-106B2 provided more than enough power to get the plane airborne, and once in the air, the Edge 540 required only two clicks of downtrim to fly straight and level.

The plane flew surprisingly light considering the air density at that altitude. The landing approach was solid, and the plane required a little throttle to bring it in for a smooth touchdown. On a cooler day and at a lower altitude, the plane would most assuredly float in for a smooth landing.

LOW-SPEED PERFORMANCE

The Edge 540 can handle low speeds exceptionally well. When I tried to put the plane into a stall attitude, it did not snap; it just slowed down more. On high-rate elevator, I jammed full up, and all it did was slow the plane down; I couldn't get the plane to stall or snap at slow speeds, and that's unheard of for a plane of this size. At a lower altitude and on a cooler day, this plane flew as if it were 5 pounds lighter. It's a great aerobatic plane for anybody looking to get into a 33-percent aircraft.

HIGH-SPEED PERFORMANCE

On airplanes of this size, you can immediately tell whether there is an incidence problem with the engine: trim it out at mid-speed and then throttle up and see whether your trims need to be adjusted. If they do, there is a problem. The Edge 540 did not seem to need trim adjustments at any speed. Once the plane was trimmed out at low speed, the trim did not change when I applied full throttle, and the plane flew exactly the same. I didn't have to use any mixing for knife-edge flight. Although there was a relatively strong crosswind, I flew knife-edges in both directions and used hardly any coupling at all. I would feel very comfortable knife-edging this plane two feet off the ground at full throttle.

AEROBATICS

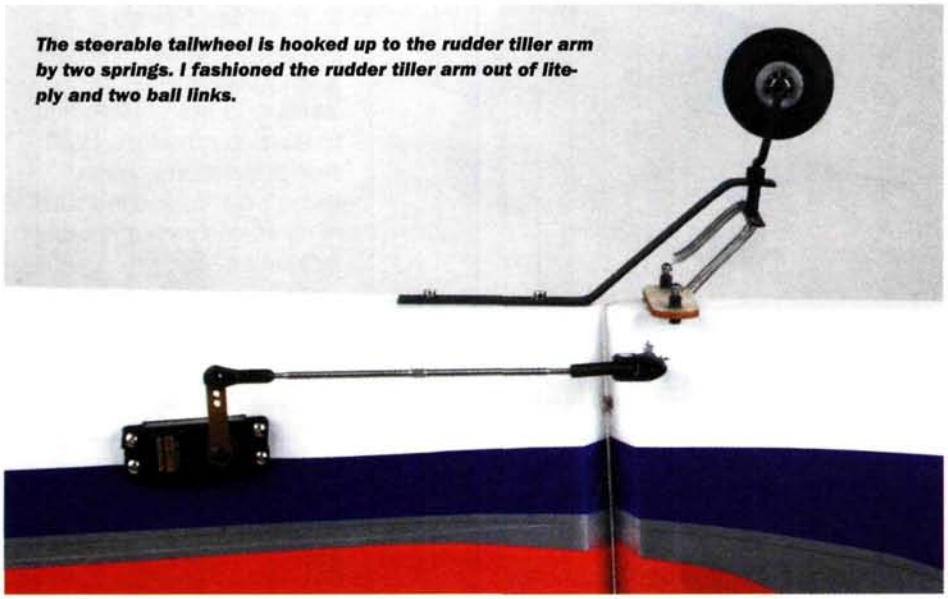
I flew the plane a little nose-heavy, yet I was still able to do 3D maneuvers. It still did nice inverted and right-side-up harriers and torque rolls, and it hovered nicely. This plane does reliable and solid knife-edges. It also did awesome-looking blenders and flat spins. It did every maneuver I could think of, and it did them all well.

I have had the privilege of flying most of Hangar 9's larger aircraft, and each new kit is an improvement on the one before. The new Edge 540 is its best plane yet. A pilot who is looking to enter IMAC competition or one who just wants to practice flying aerobatics will have a hard time finding a better plane (regardless of price) than the Hangar 9 Edge 540. This plane is a keeper!

—Dave Sullivan

FUSELAGE CONSTRUCTION

I began the fuselage construction by installing the main gear in the belly of the fuselage. This is attached to a solidly constructed undercarriage with four 10-32x1 socket-head bolts. The wheel pants then got the appropriate cutouts, and I installed them along with the wheels to finish the main landing gear.



The steerable tailwheel is hooked up to the rudder tiller arm by two springs. I fashioned the rudder tiller arm out of lite-ply and two ball links.

The tailwheel bracket position is marked at the rear of the fuselage, and the bracket is secured with two screws. Two springs are attached to the rudder tiller arm and then attached to the tailwheel's control horns; this will move the tailwheel in sync with the rudder movement.

I found a spot on each side of the fuselage for the receiver switches (see the "Two batteries are better than one" sidebar) and the ignition switch. The receiver was held in place with zip-ties, and the Matchboxes are attached with Velcro® to the fuselage so they can remain with the wings when the wings are removed. The gas and smoke tank are in the front of the fuselage and held in place with rubber bands. I attached the rubber bands to small cup hooks that I screwed and epoxied into the tank floor.

The hatch assembly includes the canopy cockpit and the pilot, and it's held on the fuselage with two 4-40 socket-head capscrews. The pilot is secured with

Man-size pattern ship—Zivko Edge 540

If you ever want to know exactly how the little plastic pilot in your pattern ship feels, strap on an Edge 540. In truth, no 1:1 scale airplane gives the three-dimensional freedom that a pattern ship has because of the power-to-weight ratio, but the Edge comes terribly close.

The Bill and Judy Zivko Edge series of airplanes consists of serious unlimited competitors. That national champion Kirby Chambliss flies an Edge speaks volumes for the airplane. The Edge is right at the leading edge (hence the name) of aerobatic technology.

To anyone who is used to flying general-aviation airplanes, the Edge 540 is going to feel scary—if for no other reason than because it has no "feel"; there are virtually no pressures at all on the control stick. These kinds of control forces have become standard for unlimited aerobatic birds. It can easily be said that you feel more pressure with your thumb on an RC joystick than you do on an Edge's control stick. The results, however, are much more numbing. No one has ever burst optic blood vessels while flying RC, although a few of us have felt like vomiting after stuffing a prized bird in.

When talking about control feel in a full-size airplane, three factors have to be considered. First is the breakout force: how hard do you have to push to get the stick started out of center? This is what determines the self-centering characteristics of the controls. Second is the stick-force gradient: once the controls are off-center, how much does force increase the farther you displace it? Third is acceleration: how quickly does the airplane leave level flight and assume the roll or pitch rate that that amount of control displacement demands? In most airplanes, the centering (break-out) force is enough to let you find center, and the controls get heavier the farther you move them. Plus, most airplanes have a perceptible time lag between control displacement and airplane acceleration.

All of this tech talk is well and good, but it doesn't mean squat in an Edge; it has no centering forces. The only way you know that the controls are in the center is because the airplane isn't moving one way or the other. And the controls never change pressure; full aileron feels just like a tiny bit of aileron, except that your head is bouncing off the canopy because the airplane doesn't hesitate a nanosecond before it rips around.

The first time I visited Bill and Judy at their plant in Guthrie, OK, and they strapped me into a 540, I thought I was prepared—but I wasn't. About all my many thousands of Pitts hours did for me was ensure a safe landing. The Zivko is so light on the controls and so incredibly quick to respond that it made my lovely little Pitts feel like a dump truck—a very creaky, overloaded dump truck.

For one thing, the Edge rolls at more than 400 degrees per second. That means it takes less than 0.9 second to do a complete roll, and when this is coupled with zero control pressures, even level flight becomes a chore.

The first time I cranked it inverted and pushed into an outside loop from the bottom, I inadvertently slammed 6 negative G on myself when I was looking for only 4; the amount of pressure it takes to push (stick force per G) was just as low outside as it was inside, which is to say it was close to zero. Just push, and it goes around.

It would take a book—or better yet, a video—to adequately describe what 45 minutes of yanking and banking in an Edge is like. Unfortunately, as hard as I try to describe it, in reality, only the plastic guy in your pattern bird can truly understand what I'm talking about.

—Budd Davisson

Visit Budd on the Web at airbum.com.

The wheel pants are securely attached to the landing gear by two 4-40 bolts and T-nuts. This quick and simple method of assembly takes only a few minutes to complete and provides a secure attachment.

There is plenty of room in the Edge 540 for all of your radio gear, and it's very easy to shift the equipment around to balance the plane.

Zap-a-Dap-a-Goo II and screws. When it was completely dry, I sealed the canopy to the hatch assembly with RCZ56 canopy glue. To ensure accurate alignment, glue the canopy to the hatch assembly while it is attached to the fuselage.

ENGINE AND COWL INSTALLATION

Hanger 9 provides excellent step-by-step instructions for installing the Zenoah GT-80 and the G-62 engines—both excellent choices. To install the 3W-106B2, I had to modify the firewall slightly. The 3W-106B2 had a smaller space between the firewall and the front of the prop backplate, and the engine mount had a different mounting-hole pattern. The engine-mounting adapter plate provided for the G-62 required minor modifications so it could be used for installing the 3W-106B2. I epoxied an additional ¼-inch piece of plywood to the back. Using the predrilled holes as a guide, I found my centerline and the proper positions for the engine-mount holes. This worked out quite well and aligned my spinner perfectly with the cowl. I mounted the 3W ignition system on top of the engine box and used the precut servo hole to route

The man behind the plane

Over the past few years, Mike McConville has designed outstanding kits for Hangar 9. His latest creation, the Edge 540, is one of Hangar 9's best releases to date. Mike's extensive background in RC started when he was young and includes eight invitations to the Tournament of Champions and two wins at the U.S. Nationals. I talked with Mike about what it takes to design a plane like the 33-percent Edge 540.

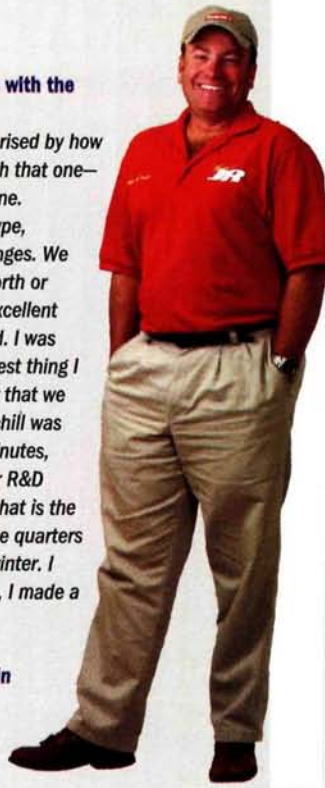
Are you responsible for deciding which airplane models to design?
Mike McConville: *Yes, one of my responsibilities at Horizon is to plan the model releases for the Hangar 9 line.*

What was your goal when you designed the Edge 540? Did you intend to create the lightest model in your 33-percent line?
MM: *Yes, lighter is always better, and it is always a challenge get a light and strong airplane through production. Since the first Extra 300L, our planes have been evolving in that direction, and each subsequent one has been a little lighter. On the Edge 540, one way we saved weight was by using the carbon-fiber landing gear.*

Were there any special design challenges that you had to overcome on the Edge 540?
MM: *It pretty much followed what we had done before with the exception of a few improvements. One of the biggest refinements we made was to move the elevator servo to the inside of the stabilizer. It makes it much easier to attach and remove the tail.*

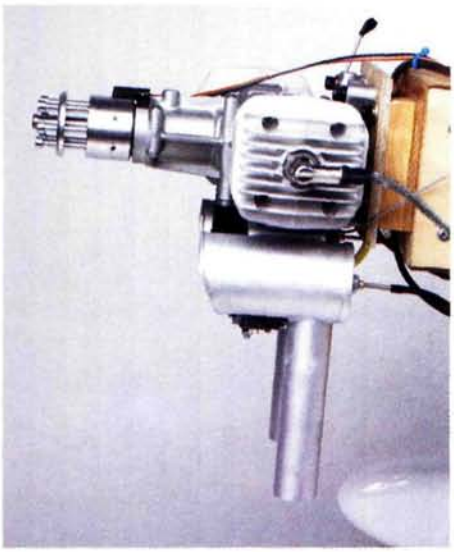
Were there any unforeseen problems or surprises with the prototype on the first flight?
MM: *Actually, it worked really well; I was quite surprised by how well it flew the first time. There is nothing wrong with that one—structural or otherwise: zero problems with that plane. Actually, we didn't make any changes to the prototype, although we usually have to make a handful of changes. We did little things, such as moving a servo back and forth or something like that—but nothing major. It was an excellent first flight, and the plane's precision was really good. I was really impressed with how well it snapped. The biggest thing I remember about the first flight was the time of year that we did it. I think it was done in January, and the wind chill was below zero. I just remember flying for about nine minutes, and I had to hand the transmitter over to one of our R&D guys because I couldn't feel my fingers. Of course, that is the downside to living in the Midwest; it seems like three quarters of our prototypes have to be test-flown during the winter. I actually made one test flight here and, a week later, I made a trip to Florida to finish the testing.*

Are there any more aerobatic 33-percent planes in the works?
MM: *We're working on a lot of stuff, and the Edge 540 won't be the last one in that line.*



the ignition wires through the fuselage. A new servo position had to be cut on the bottom of the engine box for a positive direct linkage to the carburetor. Both the gas and smoke tanks' feed lines are routed through the center hole in the engine box to the appropriate fittings.

I used a rotary tool to make the suitable cutouts for the spark plugs, exhaust stacks, engine-adjustment screws and a large air outlet in the cowl. I balanced a 3W 27x10 wooden prop and then mounted it along with a Tru-Turn spinner to finish the engine and cowl installation.



The 3W-106B2 engine required an additional spacer to get the proper distance between the firewall and the spinner backplate. To get a much more secure throttle connection, I moved the servo from the side of the engine box to the bottom.

FINAL ASSEMBLY

I set all of my control surfaces to the manufacturer's recommended throws. Because I was using the JR 10X radio, I was able to program in three rates for every control surface. To take full advantage of the aerobatic capabilities of the Edge 540, a computer radio is almost mandatory; it will definitely make control-surface setup a much easier task.

The final step of assembly was to balance the plane, and this required two people—one at each wingtip. I moved the three Duralite batteries to the rear of the fuselage to achieve a slightly nose-heavy balance.

SUMMING UP

The Hangar 9 Edge 540 is a great-looking plane that's a relatively simple build; I was very surprised by how quickly I was able to complete this large aircraft. Hangar 9 and its designer Mike McConville really did their homework on this plane. The improved design and construction techniques made this the lightest 33-percent aircraft they have, and the result is an excellent flying aircraft for anybody who's looking to join the world of IMAC competition.

The custom-cut Tru-Turn spinner fits the Edge 540 nicely. If you want to save some nose weight, you can use a carbon-fiber spinner.

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PHOTOS BY JOHN REID & JOHN STEWART

TRICK R/C Zagi-XS

High-performance fun that can take a hit!

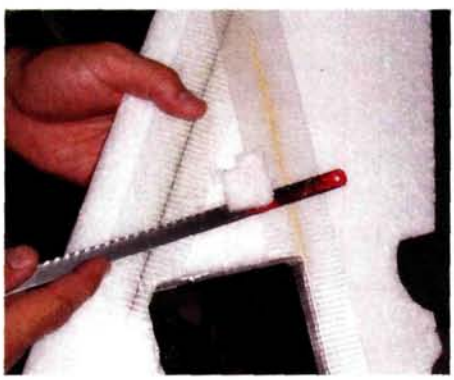
BY JOHN STEWART

With a decade of research and engineering behind it, the Trick R/C Zagi-XS gets high marks for both design and performance. This take-anywhere plane also has a wide flight envelope, so you can toss it into the back of your car for impromptu flights and look for thermals, practice aerobatics, or just enjoy some relaxing sport flying.

This kit features precision, wire-cut EPP foam wings, a lite-ply brace, carbon-fiber spars, an 1800mAh NiMH battery pack, a carbon prop with machined hub, balsa ailerons, colored tape, a hardware package, a Zagi-20 ESC, a Zagi-400 motor and a 23-page instruction manual. To complete the Zagi-XS, you'll need only a 3-channel radio with elevon mixing and 2 servos.

CONSTRUCTION

Even though it's an important factor, the goal weight of an aircraft is sometimes overlooked during the building process. With its battery pack installed, the finished Zagi-XS should weigh 25.5 ounces. One or 2 ounces in either direction will make a tremendous difference to flight characteristics, so think first before you apply that extra coat of spray adhesive or piece of reinforcing tape! It's a good idea to reinforce your model as suggested in the instruction manual, if you've never flown a flying wing before, intend to fly this plane in combat, or just need extra durability. If, however, you want maximum flight performance and flight times, build light. Since this was my first attempt at flying a model of this design, I reinforced the wing with fiber filament tape, as suggested in the instructions. The extra tape and spray adhesive added about an ounce.



I used a hacksaw blade to cut the portion of the servo-bay cookie that protruded from the bottom of the wing assembly.

■ **Wing.** At first glance, the EPP foam wing-cores seem rather typical, but further inspection reveals that the servo bays, electronics compartment, spar slots and wing-brace channel are already cut at the optimal locations. This makes assembly much easier and takes the guesswork out of where to place your components. In fact, the instruction manual states that it is never necessary to add additional weight for balancing the aircraft if the recommended components are used.

After lightly sanding the wing-cores, I used 3M 77 to glue the wing halves together and to glue the plywood brace and carbon-fiber spars into place. To join the wing halves, apply a long bead of glue to the root of each wing and spread the glue with a small brush or a piece of stiff cardboard. When the adhesive is dry to the touch, use the foam beds from the wing-cores as an assembly guide and join the wing panels; this method will ensure a perfect fit.

Install the wing brace and spars by working a bead of 3M 77 into the appropriate grooves with a piece of stiff cardboard or scrap balsa. Apply a light coat of 3M 77 to each side of the brace and spars, and then insert them into the appropriate slots as instructed. Here again, the foam beds from the wing-cores are used as a guide. When everything is in position, place small weights on the wing assembly to keep everything aligned, and let the assembly dry for a couple of hours.

■ **Electronics compartment.** While the wing assembly is drying, your next step is to build up the electronics compartment. Cut out the black styrene pieces at the indicated edges, solder the motor to the ESC and hook up all the electronics and servos for elevon or flying-wing operation. I really appreciated that the kit included a charging lead.

When properly set up, the Zagi-20 ESC features an arming procedure that is started with the throttle fully off. Move the throttle stick to full-on and then back to full-off. The ESC will emit a faint tone to signal that it is armed, and the motor will then turn on when the throttle stick is moved. I discovered that I had to reverse the direction of the throttle on my radio so that the ESC would properly arm itself. This ESC is BEC-equipped and has a low-voltage cutoff.

■ **Servo pre-installation.** The electronics-compartment cutout is completely removed from the wing assembly at this stage; push the servo cutouts out of the wing assembly just enough to make room to flush-mount the servo. Use a sharp hacksaw blade to make the portion of the cutout that protrudes from the bottom

specifications

MODEL: Zagi-XS

MANUFACTURER: Trick R/C

TYPE: electric flying wing

WINGSPAN: 48 in.

WING AREA: 2.8 sq. ft.

WEIGHT: 26.5 oz.

WING LOADING: 9.5 oz./sq. ft.

MOTOR INCLUDED: Zagi-400 reverse-rotation pusher motor w/Zagi-20 ESC

BATTERY INCLUDED: 8-cell, 1800mAh NiMH

RADIO SYSTEM REQ'D: 3-channel w/elevon mixing and 2 servos

RADIO SYSTEM USED: Futaba 9CAP transmitter, Hitec Electron 6 receiver, 2 Hitec HS-81 servos

FLIGHT DURATION: 7 to 8 min.

PRICE: $175

FEATURES: wire-cut EPP foam wing halves with die-cut servo and electronics bays; lite-ply brace; carbon-fiber spars; 1800mAh NiMH battery pack; carbon-fiber prop with machined hub; balsa ailerons; tape; complete hardware package; a Zagi-20 ESC; a Zagi-400 motor; and a 23-page instruction manual.

COMMENTS: the Trick R/C Zagi-XS is an easy, straightforward build, and the included equipment is a perfect fit. Every time I fly this plane, I like it more.

HITS

- High-quality EPP wing-cores.
- Well-thought-out design and instructions.
- Factory cutouts make radio installation easy.
- Comprehensive kit includes everything except glue and tools.

MISSES

- None.

flight performance

I set my control throws to the recommended ½ inch up and down and made sure that the center of gravity was right on at 8 inches back from the nose of the plane. I then practiced hand-launching and gliding the plane until it would glide straight ahead. A few clicks of trim seemed to do the trick.

TAKEOFF AND LANDING

Keep the nose level until the plane gains sufficient speed to climb out. You'll be impressed by how fast the plane flies when it's up to speed and at full power. Landings are simple, but the plane really wants to float. You can really stretch those landings; just make sure that the power is off when you touch down.

LOW-SPEED PERFORMANCE

Low-speed performance is much more manageable with 60-percent exponential; however, the Zagi-XS still has a tendency to drop a wing at really slow speeds, particularly during turns. Take it up high and fly it slowly to get used to this characteristic. You'll find that it recovers nicely when given time to build up airspeed, but as a general rule, restrict extremely low speeds to landings and high-altitude flights.

HIGH-SPEED PERFORMANCE

The Zagi-XS really comes alive at high speeds. Loops, fast rolls, high-speed dives and inverted flight are all fun to do, but they use up the battery quickly. I like to experiment with various power settings to maximize flight times. I regularly get flight times of 10 minutes while mixing in sweeping turns, fast loops and rolls and high-altitude thermal hunting. After floating on thermals for a while, I like to push the nose straight down for a thrilling high-speed descent followed by a large loop.

AEROBATICS

The Zagi-XS can easily perform basic maneuvers such as rolls, loops and inverted flight. Once, my dumb thumbs caused it to dive at high speed straight into the ground. It hit very hard directly on the nose. It would have been all over at this point for most models, but the Zagi-XS was unharmed.

flush with the wing. The servo cutouts are designed to fit Hitec HS-81 servos, but they can be enlarged or shimmed to fit other servos.

■ **Taping the wing.** Apply spray adhesive to any surface that will be taped, and then use fiber-filament tape to secure the electronics-bay floor and to reinforce the wing in strategic locations. Colored tape gives your Zagi-XS its own distinctive look. The manual recommends that the model be built with contrasting colors to make the plane easier to see. Use darker colors on the bottom; be creative.

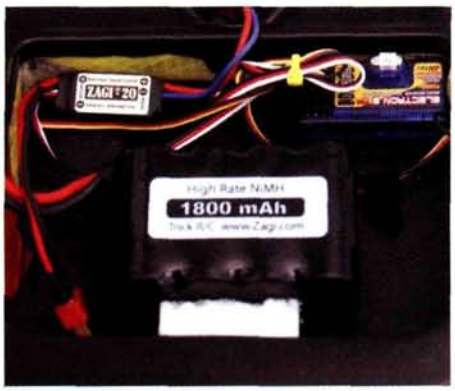
■ **Final steps.** When you prepare the elevons for installation, make sure that you sand a 45-degree angle in the leading edge; if you don't, the downward movement of the elevons will be restricted.

The servo cutouts are designed so that the servos are attached by a press-fit. I wasn't completely comfortable with this method, so to provide additional security, I covered them with small pieces of colored tape that match the plane's color scheme. When my servos were in place, I used the provided pushrods and clevises to hook up the elevons.

The electronics bay consists of a motor tray and a hatch. The motor tray can be taped or glued into place; I used glue for a cleaner look. A dab of silicone adhesive was all it took for a secure fit. The hatch was then secured with tape hinge and Velcro®. This design allows easy access to all electronics.

The battery pack, ESC and receiver are all secured to the bottom of the electronics bay with Velcro®, and a small hole and slot along the bottom of the wing make a discreet and secure location for the antenna.

Last, hook up your electronics, position the battery pack to achieve the recommended center of gravity, and check the system for proper operation.



When doing extreme maneuvers or when first learning how to fly your Zagi-XS, stick a piece of tape over the front of the hatch to keep it closed.

For extra security, I put a piece of double-stick tape between the winglet and the tip of the airfoil.

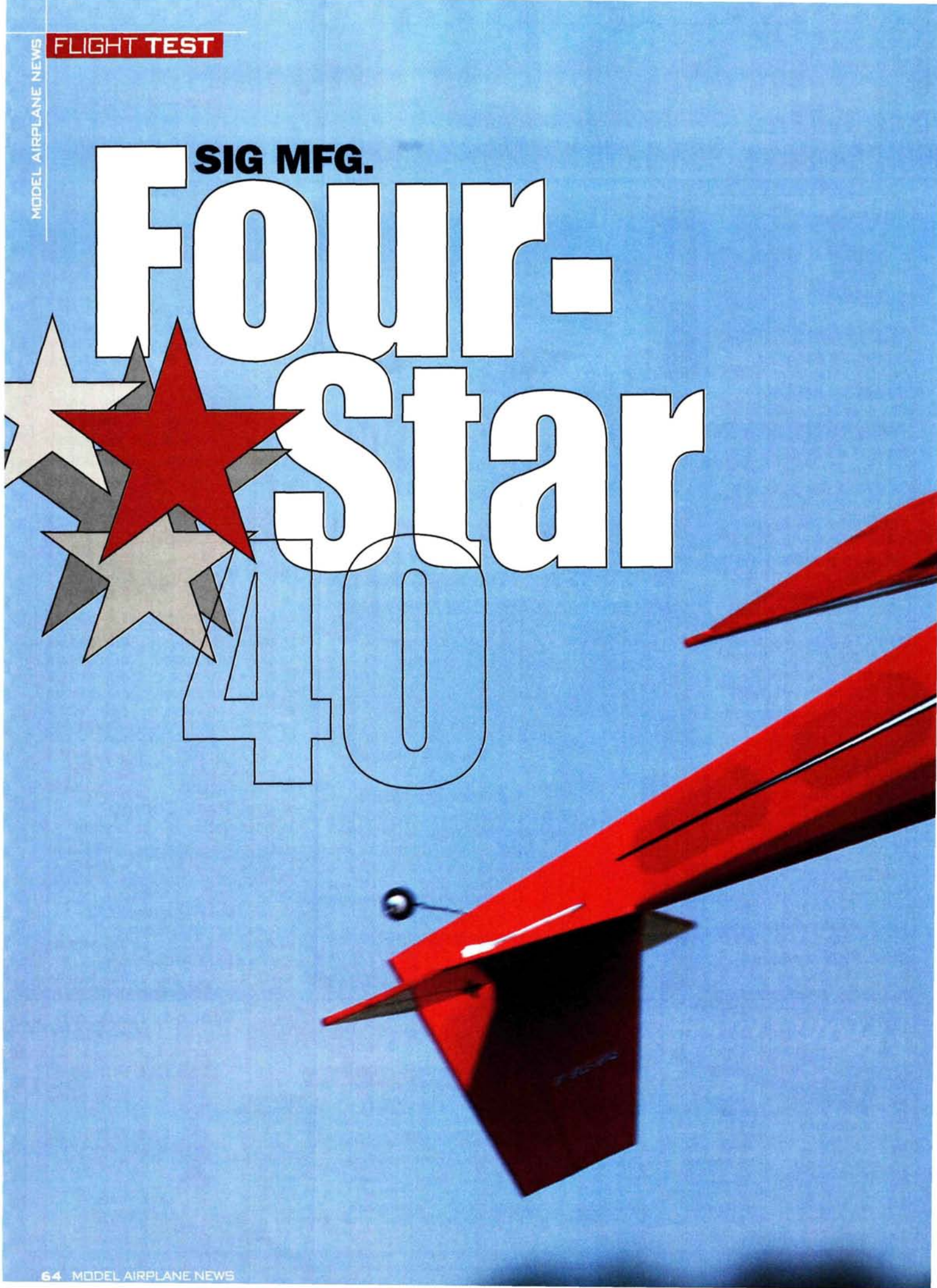
LET'S GO FLY

The Zagi-XS is a cinch to build and a real blast to fly. Trick R/C really made building problem-free. Almost all of the necessary materials are included in the kit, and the die-cut electronics' cutouts take the guesswork out of positioning the servos and other components. If you build this kit and set it up as instructed, you will have a great flying plane. ✈

Trick R/C (310) 301-1614; zagi.com.
Futaba Corp. of America; distributed by Great Planes Model Distributors Co. (800) 682-8948; (217) 398-6300; futaba-rc.com.
Hitec RCD Inc. (858) 748-6948; hitecrcd.com.

SIG MFG.

Four-Star 40

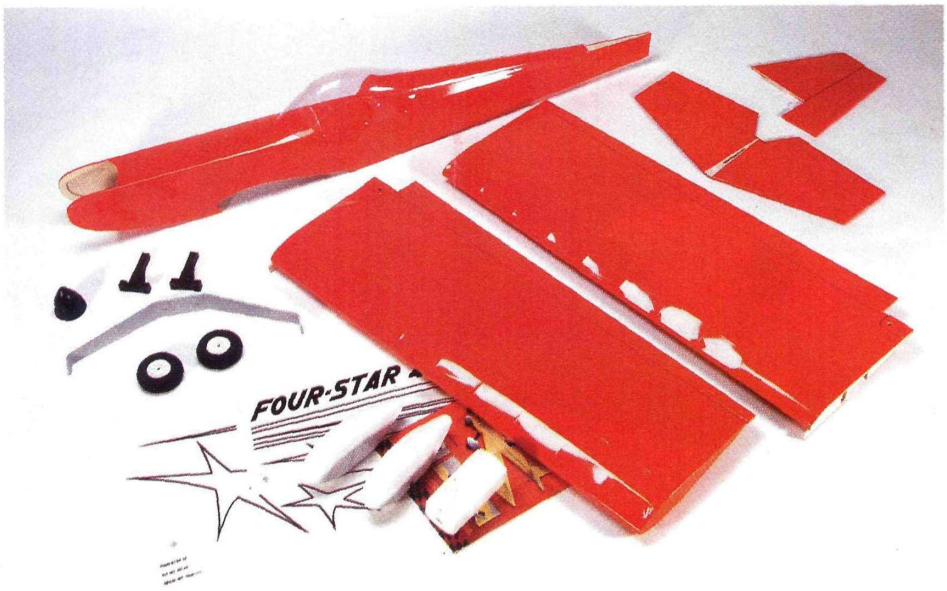


A favorite sportster is reborn in ARF form

BY BILL JENSEN

The Sig Four-Star Series of sport planes includes the 40 and 60 sizes in kit and ARF versions and a 120-size available only as a kit. In the decade or so since the Four-Star 40 kit was introduced, it has developed a reputation for being a tough, easy to build and fly sport aerobatic airplane. Many have been flown as first low-wingers and many more as backup sport planes for seasoned RC'ers. I've owned my kit-built Four-Star 40 for a number of years, and I use it as an engine test-bed and as a winter mule with skis! The plane has proven to be rugged and easy to repair, and it fits in my full-size wagon with the wing on! When the chance came along to review the ARF version and compare it with my veteran kit, how could I refuse?

PHOTOS BY PETE HALL



specifications

MODEL: Four-Star 40 ARF

MANUFACTURER: **Sig** Mfg. Co.

TYPE: sport low-wing ARF

WINGSPAN: 59.75 in.

WING AREA: 604 **sq.** in.

LENGTH: 47 in.

WEIGHT: 5 lb. w/the **Norvel AX-40**

WING LOADING: 19.07 oz./sq ft.

ENGINE REQ'D: .40 to ,46ci 2-stroke; .40 to .53ci 4-stroke

ENGINE USED: Norvel AX-40

PROPS USED: APC 11x5, Master Airscrew 10x6

FUEL USED: Sig Champion 15% nitro

RADIO REQ'D: 4-channel, 4 standard servos (aileron, elevator, rudder, throttle)

RADIO USED: Futaba T6XA computer FM radio

PRICE: $150

FEATURES: built-up balsa and lite-ply construction; covered in Oracover film; photo-illustrated assembly manual; complete hardware package.

COMMENTS: the Four-Star 40 is a tail-dragger that takes on rough grass and gravel runways with ease. It's a great, all-around sport plane that's tough enough to withstand abuse.

HITS

- Rugged sport flyer.
- Easy-to-repair Oracover film covering.
- Complete hardware package.
- Nice, molded wheel pants.

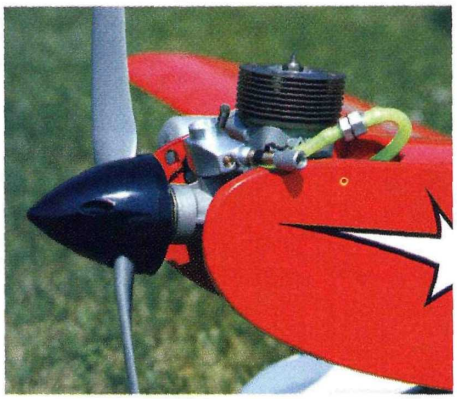
MISSES

- Decals require hand-cutting.

ASSEMBLY

This ARF comes very complete, and for the most part, I used the hardware items that came with it. Things fit together well, and I had no assembly problems. The plane's design is quite basic with no undue complexity. One extra step I take with all my planes is to fiberglass the wing's center section for added protection during violent aerobatics. The manufacturer's wing-joint design on this bird is probably strong enough as is, but this extra step is a carry-over from the days before ARFs were popular, and we built most planes from kits or scratch and always fiberglassed the wing's center joint.

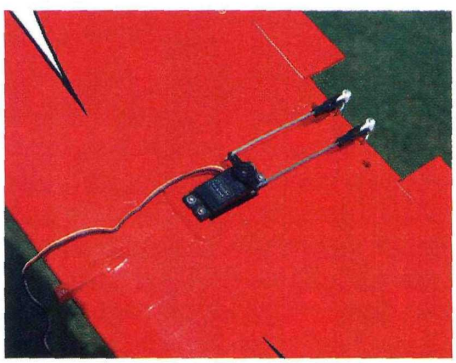
• **Engine installation.** Installing the engine is a breeze, since the nose area is mostly open (only a cheek plate on each side), and the holes are predrilled in the firewall. No fussy cowl fitting required here! I cut a relief in the right cheek plate for the muffler and sealed the edge with thin CA and color-matched fuelproof paint. I selected the Norvel 40 for this project, but any engine in the suggested size range would be easy to mount. In fact, my kit-built Four-Star 40 has been used to flight-test six different powerplants over the years!



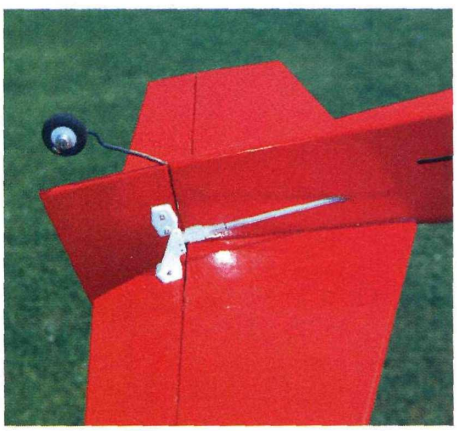
The nose on the *Four-Star* is open, so *installing the Norvel AX-40* was a *breeze,* as it *would be for virtually any* 40-size 2- *or 4-stroke.*

I used the predrilled holes in the firewall to mount the engine for this review. If you plan to do extensive inverted flying with the Four-Star (or any other plane), however, it's a good idea to mount the engine so that the needle valve is at the same height as the tank's centerline. If you do that, the fuel-head pressure is the same whether flying upright or inverted and provides more constant rpm. On this model, that means lowering the engine about $^{5}/_{A}$ inch, but the tradeoff is less prop ground clearance. You can start with the standard engine location, but if you notice that the engine runs rich when you fly inverted, you can use this trick. Another trick I use is to adjust engine downthrust to regulate approach speed; more downthrust gives a slower approach, and less up-elevator is required.

• **Radio installation.** Sig has made this step easy by providing a built-in servo



Ailerons are *actuated by torque rods via* a *single, wing-mounted* servo.



The *tailwheel is small, but the Four-Star gets up and flying easily, even* off *bumpy* grass *fields.*

flight performance

TAKEOFF AND LANDING

The typical tail-dragger setup is great for grass and rough fields, but it usually requires rudder inputs for straight takeoffs, and the Four-Star is no different. Landing approaches are easy to slow down, but as with any tail-dragger, a no-bounce "greaser" requires finesse and a little luck. Don't worry if you don't nail them the first time; they're great fun to practice!

LOW-SPEED PERFORMANCE

Stalls are very soft and usually straight ahead and easy to fecover from by letting off the elevator. Flight at minimum need and during slow approaches is easy and natural; just use ifie elevator to control the speed.

HIGH-SPEED PERFORMANCE

At full tilt, tracking is smooth and straight with no bad habits.

AEROBATICS

A lot is possible here! With the suggested control travels, all the standard sport aerobatics are big, smooth and flowing: roils, ijoint rolls, inside and outside snaps, loops, upright and inverted sjpins, tail slides, knife-edge and more! With more throw, flat s!>ins, torque rolls and the like are possible. This is not a "flippy-fpn-fly-type" plane, however, so don't expect super-tight maneu-vvers; there isn't enough control surface for that.

t I like to fly knife-edge maneuvers. For easy knife-edge tbacking, I dialed in some rudder-to-elevator mix; I settled on 20-percent up-elevator with left and right rudder. There was lit-tle, if any, yaw-to-roll coupling on my ship, so no rudder-to-aileron mix was needed. Once set up, my ship could knife-edge horizon-to-horizon—smooth and steady!

The editors wish to thank the members of the fairfield League of Yankee Radio Controllers for the use of their field in Southbury, CT.

The radio tray comes installed and is cut to accept standard-size servos. The pushrod tubes even come installed!

tray that accepts standard-size servos and by preinstalling the pushrod tubes. What a timesaver! I found that I could stiffen the nylon inner pushrod tubes for the elevator and rudder by installing 2-inch 2-56 rods and clevises at the control horns. I fitted a soft-foam block to retain the receiver and battery and used the control throws specified in the manual. Little trim input was needed on the first flight—a testament to the straightness of **the** jig-built **airframe!**

• **Finishing details.** All that was left to do was to install the landing gear and trim and apply the decals. The decals are really the only place where Sig doesn't do the hard work for you; the decals must be hand-trimmed, and this can take some time. Of course, you'll have plenty to spare because of all the time you'll save on the rest of the assembly, but precut decals would have been nice.

CONCLUSION

The quality and workmanship of the Four-Star 40 are topnotch, and much of the detail work has been done for you. Having flown the kit version for years, I was pleased—but hardly surprised—that the ARF version exhibited the same familiar flight experience. The Norvel 40 is a great match for this bird; it offers brisk performance and plenty of power for any maneuver that the Four-Star is up for. I like the ARF concept, especially when the quality is this good, and I can have one of my favorite planes without going through the trouble of building or covering it myself! ±

APC; distributed by Landing Products (530) 661-0399; apcprop.com.

Futaba; distributed by Great Planes Model Distributors (217) 398-6300; (800) 682-8948; futaba-rc.com.

Master Airscrew; distributed by Windsor Propeller Co. (957) 41-0250; (916) 631-8385; masterairscrew.com.

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Oracover; distributed by Hobby Lobby (615) 373-1444; hobby-lobby.com.

Sig Mfg. (800) 247-5008; (641) 623-5154; sigmfg.com.

Norvel's new-age power

One look at Norvel's AX-40 engine, and you can see that it is not just another 40-size 2-stroke. The cylinder head is art unusual 3-piece design; the head button and head shim are held in place by an aluminum ring that screws into the one-piece cooling fin/cylinder sleeve. The distinctive color of the fin/sleeve piece is due to the second novel feature-an oxide-based ceramic coating. The sleeve's interior is lined with Sliktek—a Teflon-like substance that reduces friction and increases durability but is much lighter than traditional chrome or nickel plating. The result is a 40-size powerplant that weighs just 13.2 ounces! It isn't light on power, though; the AX-40 is rated at 1.4hp at 16,000rpm. Not bad for a suggested retail price of $110!

MS COMPOSIT Hornet

PHOTOS BY DERON NEBLETT

A precision micro heli

BY RICK BELL

The Hornet CP (collective pitch) was a milestone achievement in the micro heli world. It emulated larger glow-powered helis and featured full collective pitch, a 120-degree CCPM (cyclic collective pitch mixing) control system and a shaft-driven tail rotor. Its performance was on a par with glow-powered helis, and it could be flown indoors or out. It was, however, somewhat difficult to build correctly and took some effort to flight trim for maximum performance. The new MS Composit Hornet II is an updated version of the original Hornet and shares many of the same components and design ideas. It has been improved in several ways, and not only is it easier to build, but it's also a little larger for greater stability while retaining the agility that the original Hornet is known for.

MODEL OVERVIEW

Structurally, the Hornet II features a completely new canopy, mainframe, landing gear, tail gearbox housing and a longer tail boom. The tail rotor's output shaft is now metal instead of carbon fiber, and the hub is attached to it. Dual carbon-fiber rods brace the tail boom, and the tail-rotor drive shaft is supported by four ball bearings for smooth operation.

The mainframe is modular and uses a combination of molded and carbon-fiber parts. The original Hornet's carbon-fiber landing gear has been replaced by a more traditional molded landing gear that is bolted to the underside of the mainframe. The tail boom is clamped to the mainframe, and the tail gearbox is clamped to the tail boom. This welcome change makes gear-mesh adjustment a breeze when compared with earlier Hornets. The main rotor blades are also markedly different: instead of the double-tapered blades usually supplied, the Hornet II's blades are longer and have a constant chord. Combined, all these improvements give the heli a more aggressive look and performance.

KIT CONTENTS

The Hornet II comes in a rather small box. Included are written instructions in Czech, English and German as well as a nice set of CAD-drawn illustrations. The two complement each other and make it easy to understand how to build and set up the heli. The parts come in a large plastic bag that contains smaller bags with parts separated by their assembly steps. There's no need to open any bags until you require the parts. Considering that many of the parts are very small and could be easily lost, this is a good thing. The clear, vacuum-formed canopy is in halves and must be trimmed to size, painted and assembled. The kit also includes a Speed 300 brushed motor, a cardboard pitch gauge, stick-on decals for the canopy, a set of carbon-fiber main rotor blades and a bag of carbon-fiber tubes and rods.

The quality of parts molding is excellent. All parts fit together well, and there wasn't any molding flash.

The powerful tail rotor operates smoothly.

ASSEMBLY

The assembly is broken down into six major steps: chassis, tail rotor, main rotor, final assembly, equipment installation and setup and adjustment. Each step in the manual lists the parts you need. Pay attention to the bearing sizes, and use the one called for in each step; the bearings all look similar, so it's easy to use the wrong one. Use thin CA for all glue joints, and use it sparingly. I recommend that you place a small drop on a pin or piece of thin wire, and then apply it; don't apply the glue straight from the bottle.

CHASSIS AND TAIL-ROTOR ASSEMBLY

First assemble the chassis; it goes together easily. Be sure to use enough glue when you glue the rear frame support between the mainframe and the lower frame base.

Next are the tail boom, the gearbox and the tail rotor assembly. There's a fair number of small (make that *tiny*) parts, and you must be careful not to lose any of them. I've heard stories about how difficult it was to build the first-generation Hornet's tail rotor. MS Composit has made considerable efforts to alleviate these difficulties, and building the Hornet II's tail rotor is now as

specifications

MODEL: Hornet II

MANUFACTURER: MS Composit

TYPE: aerobatic micro helicopter

MAIN ROTOR DIAMETER: 560mm

LENGTH: 680mm

WEIGHT: 265g (w/out battery)

MOTOR REQ'D: Speed 300 or equivalent brushless

MOTOR USED: MS 300 Series (included)

RADIO SYSTEM REQ'D: 5-channel heli w/120 deg. CCPM mixing, 4 microservos, micro-gyro, micro-receiver

RADIO SYSTEM USED: JR 10X transmitter, Berg-5 DSP II micro-receiver, 3 Hitec HS-55 microservos, 1 Hitec HS-50 microservo, MS Composit MS-44 piezo gyro, MS Composit M116 ESC

BATTERY USED: MS Composit 7-cell, 600mAh NiMH/ Thunder Power 11.1V, 860mAh Li-poly

FLIGHT DURATION: 6 to 7 min.

PRICE: $225

FEATURES: modular construction; mainframe is a combination of molded and carbon-fiber parts; ball bearings on all pivots and rotating parts; molded landing-gear legs and skids; new, larger canopy design; all-metal factory-assembled tail rotor hub and shaft; dual carbon-fiber tail-boom supports; symmetrical carbon-fiber main blades; complete hardware; Speed 300 motor; stick-on decals; illustrated assembly manual.

COMMENTS: the MS Composit Hornet II is an amazing micro heli. It's a little larger than its predecessor, the Hornet CP, and this translates into a more stable model. The Hornet II's construction is also greatly improved and addresses many issues of the older design. Where it really shines, though, is in its flight performance; in its box-stock configuration, it's 3D capable.

HITS

- Easy to build.
- Looks great.
- Solid flight performance.

MISSES

- None.

flight performance

I made my first hovering flights at an indoor sports arena. I turned on the transmitter and connected the battery; I spun up the main rotor to check the blade tracking, and it was almost spot-on. There was no vibration, and I set the trims for hands-off hovering.

GENERAL FLYING

I found it very advantageous to have a large indoor venue for the Hornet II's first flights. I was able to hover it around without worrying about hitting furniture, walls, etc. After my nerves had settled down a bit, the Hornet II exhibited good control responses with excellent stability. I hovered out three battery packs to get a feel for the heli. I also took it outside and hovered around in light wind. I was surprised that the Hornet was so solid and stable. Forward flight was easy, and the model displayed good handling characteristics. I flew several circuits that consisted of figure-8s, aggressive turns and full-throttle sprints. There's no doubt that the Hornet II is the most responsive, yet stable, micro heli I have ever flown.

AEROBATICS

This was an entirely new experience for me, and I found the Hornet II a very capable aerobat. The elevator and roll rates are fairly quick, and the heli responds "right now." I did notice that the response between the cyclic controls and the collective pitch is a little unbalanced; because the servos move so little for collective pitch, the cyclic seems to lag. I understand that MS Composit has a Bell Hiller upgrade that addresses this problem by making the cyclic controls more responsive. Venturing into more aggressive aerobatics, the Hornet II handled flips, consecutive loops, loops with a pirouette at the top and other 3D-style maneuvers. I believe that MS Composit has a winner on its hands!

easy as it could be, although there are still a couple of things to watch for. When you glue the support bearings onto the carbon-fiber driveshaft, smear a little thin CA over the shaft, and then slide the bearings into position. This way, you'll avoid getting CA in the bearings. The gears on each end of the shaft and on the tail-rotor output shaft are a tight friction-fit; glue isn't needed to secure them. The orange spacer tube that goes on the tail-rotor shaft between the bearings might be a little long. If needed, trim it slightly so it fits snugly between the bearings. Trim only a tiny bit at a time, as the length of this spacer is critical to the proper operation of the tail rotor. If it is even fractionally too long, it will distort the gearbox frame and force it out of square.

Building the tail rotor and pitch-change assembly takes some care, as the tiny parts all have to fit together perfectly without binding or being too loose. MS Composit deserves a lot of credit here; despite their tiny sizes, all parts went together well. After a few minor tweaks, the tail-rotor assembly worked very smoothly.

MAIN ROTOR ASSEMBLY

The main rotor is built in three stages: the main rotor head and shaft assembly, the flybar assembly, and mating them and adding the swashplate. There are six bearings in the head, and this is where you must carefully check their sizes. Lay all six bearings on a flat surface, and you'll see that two are a little thinner. Use these two bearings in the flybar stabilizer lever. If you used them in the blade grips, they would probably bind during operation.

FINAL ASSEMBLY

I fitted the completed main rotor to the chassis and attached the main gear. I used a thin T-pin to line up the holes between the gear and the shaft and then inserted the lock pin. It's a tight fit, so be patient. I then fitted the tail-boom assembly; be sure to install the horizontal fin/boom support holder on the tail boom first. I adjusted the gear mesh by sliding the boom in and out until the mesh was perfect—no binding and only the smallest amount of backlash. Then secure the boom to the chassis using the molded-in clamp. As a final check, spin the main gear; it and the tail rotor should spin freely. I glued the tail-servo mounting plate to the tail boom and the cyclic-servo mounting plate to the chassis, added the tail-boom supports, the motor and pinion and the tail fins and finished the canopy. This completes the assembly of the Hornet II.

The collective pitch rotor head has a full complement of bearings and is quite aerobatic.

RADIO INSTALLATION AND SETUP

The instructions for the radio installation and setup are fairly comprehensive. If you are familiar with CCPM, you shouldn't have any problems. If you are an absolute beginner, it would be a good idea to find a heli pilot who has experience with CCPM and the Hornet as well.

I laid out the radio gear on my workbench and did all of my setup. As I had experience with CCPM operation, I had no problems getting the setup in the ballpark. I then installed the gear in the heli and did a final check. When everything worked as it should, I was ready to flight-trim the Hornet II.

SUMMARY

The MS Composit Hornet II is a great micro heli. It is well packaged and builds easily. The manual provides lots of information, and when combined with the CAD drawings, very little is left to question. The micro heli flies very well and equals many of the .30-size helis in performance; experienced pilots will enjoy its 3D capabilities. If you're looking for a micro heli that can be flown indoors and out, the MS Composit Hornet II is hard to beat. ✚

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Guaranteed to impress!

Ste

BY STAN KULESA

The Stearman is one of the most recognizable and beloved aircraft, and it has a reputation for excellent flight characteristics, reliability and rigorous construction. After the War, someone decided to fit one of these aircraft with a Pratt & Whitney engine and to add a cowl, wheel pants and two ailerons to the top wing; thus, the Super Stearman was born. This new version was highlighted by exceptional aerobatic performance.

GREAT PLANES

Super Stearman

PHOTOS BY PETE HALL & GERRY YARRISH

Great Planes' latest IMAA-legal, giant-scale entry, a 71½-inch-span Super Stearman, is guaranteed to impress; it's just plain beautiful and flies as a Stearman should.

LET'S START

The model comes expertly covered and trimmed with MonoKote. This is a big plus because MonoKote is so readily available. The painted fiberglass cowl, the wheel pants and the painted landing gear and struts match the covering perfectly.

The kit box wasn't as large as I had expected it to be; the packing was tight and efficient. Each major component is individually packaged, so everything is easy to identify, and the well-packed parts weren't damaged during shipping.

The instruction manual is easy to read and nicely laid out, and the picture quality is well above average. Safety considerations and fun facts about the Stearman are also included.

■ **Wing.** To begin construction, attach an aileron to each wing half. CA hinge material is included; each aileron has three cut hinge slots. Then join the wing halves to create two, one-piece wings. The top wing doesn't have any dihedral but the bottom wing does. I used 30-minute Z-Poxy for this step.

The Stearman's aileron servos are in the wing panels just in front of the ailerons.

Each wing has about 24 ribs. The ribs beyond the sheeted center section are cap-stripped and have lightening holes. The structure is very solid, and there wasn't any movement when I tried to twist the panels. Balsa sheeting is used on the leading and trailing edges and on the center section.

The lower wing is held in place by two nylon dowels on the leading edge and two nylon screws that pass through a plywood plate on the trailing edge. The top wing is attached to cabane struts with four 4-40 socket-head screws. The cabane struts are permanently attached to the fuselage with four wood screws. Two, one-piece, N-shaped outboard struts are also held with 4-40 screws that pass through L-brackets. An assembled plywood carrying handle facilitates the transportation of the fuselage and also stores the two N-struts.

■ **Fuselage.** The fuselage is constructed around a plywood frame with lightening holes. The forward section is balsa-sheeted, and the aft end is open-framed and uses balsa stringers for scale shaping. There are six plywood formers and a ¼-inch-thick firewall. The firewall and wing saddles are already fuelproofed.

The engineering behind the one-piece aluminum landing gear with fiberglass fairings deserves special recognition. The detail work on the fairings is exceptional, and the gear fits snugly into place with only a minimal gap. The paint also perfectly matches the white MonoKote. The gear is attached to the bottom of the fuselage with five 8-32 screws. A rounded, solid-balsa belly pan is glued over the landing gear to match the contour of the fuselage bottom. The axles, wheels and one-piece painted fiberglass wheel pants are added later.

The stabilizer and fin are epoxied into channels on the aft end of the fuselage; I

specifications

MODEL: Super Stearman ARF

MANUFACTURER: Great Planes Model Mfg. Co.

TYPE: giant-scale ARF

WINGSPANS: 71.5 in. (top); 69 in. (bottom)

WING AREA: 1,466 sq. in.

LENGTH: 56.75 in.

WEIGHT: 14 lb. 12 oz.

WING LOADING: 23.17 oz./sq. ft.

ENGINE REQ'D: .91 to 1.20 2-stroke or 4-stroke

ENGINE USED: O.S. Max 1.20 4-stroke

PROP USED: Zinger 15x8

FUEL USED: Tower Power 15% nitro 4-stroke

RADIO REQ'D: 4-channel (rudder, elevator, ailerons, throttle) w/5 to 7 servos

RADIO USED: Airtronics RD6000 Super transmitter w/Airtronics 94738 servos on control surfaces and a 94102 servo on throttle

PRICE: $379.99

FEATURES: built-up lite-ply and balsa ARF covered in MonoKote; comes with two pilot figures, dummy radial engine, painted fiberglass cowl and wheel pants, polished-aluminum spinner, steerable tailwheel and all necessary hardware.

COMMENTS: with its exceptional color scheme, great instruction manual, high-quality construction and covering and a complete hardware and accessory package, the Super Stearman is a cut above the rest.

HITS

- Well-engineered.
- Quick assembly.
- Exceptional scale detail.

MISSES

- None.

flight performance

TAKEOFF AND LANDING

Ground handling is excellent; throughout the taxi, the model tracked in a deliberate and scale-like manner. The takeoff roll is very controlled; it requires a little right rudder as throttle is applied. At full throttle, the model is airborne after about 20 to 30 feet. The climbout is gradual at 20 degrees.

Trim adjustments on the test model included five clicks of down-elevator and two clicks of right aileron.

Landing approaches are very solid and controlled. Line the Super Stearman up at the end of the runway, gradually reduce throttle, and the model settles in nicely. Sufficient airspeed for landing will help it to "slip" in; anything too slow will cause it to bounce on its gear.

LOW-SPEED PERFORMANCE

Low-speed performance is noteworthy; all flying surfaces remained highly responsive, even in a moderate headwind. The Super Stearman can be slowed to a crawl.

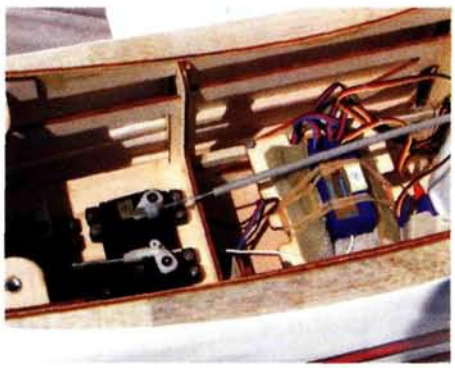
HIGH-SPEED PERFORMANCE

Although the O.S. 1.20 4-stroke is at the high end of the recommended power range, it flies the Stearman quite nicely without over-powering it. The speed is not excessive, but you do have much more torque to turn a larger, more efficient prop for better climb performance. The bigger prop also helps slow the model down for landings.

AEROBATICS

The Super Stearman is capable of a full range of scale maneuvers. On high rates, you can expect one roll every 1.5 seconds; rotation is right on the axle. Spins are tight and snappy, although inverted spins are a bit wider; recovery was uneventful, and inverted flight required some down-elevator. The Stearman tracks well through 50-foot-diameter loops. The ailerons are so effective that the model can be turned without rudder coordination, although much nicer, flatter banked turns are achieved with it.

The editors wish to thank the members of the Westchester Radio Aero Modelers (WRAM) Club for kindly allowing use of their flying field in Patterson, NY.



Radio compartment: there is plenty of room with the bottom wing removed, and everything is easily accessible.

again used 30-minute Z-Poxy. The instruction manual does a good job of explaining how to align the stabilizer properly. The empennage is flat and has a balsa frame with balsa ribs. The ribs are perpendicular to the trailing edge of the fin and stabilizer. Three CA hinges attach each of the elevator halves, and another three hinges hold the rudder. A shock-absorbing tailwheel assembly is mounted in the aft end of the fuselage. A scale triangular tail block goes on the bottom, aft end of the fuselage to contour it to the rudder.

Insightful engineering is evident when you attach the one-piece fiberglass cowl to the fuselage. Instead of having screw heads on the exterior, the cowl is connected to a plywood ring on the firewall that is tapped for four blind nuts. It's easy to access these blind nuts through the back of the cowl with a 4-40 ball driver.

A plastic 9-cylinder dummy engine fits snugly inside the cowl. A portion of the bottom of the mold has been removed to allow the air to circulate over the engine's cylinder head. After drilling holes to accommodate the aluminum tubes that simulate the dummy engine's pushrods, I spray-painted the mold with flat-black LustreKote. For added detail, I cut short lengths of red wire to replicate spark-plug leads. You'll need to make small holes in the cowl to accommodate the glow plug, the needle valve, the remote fueling valve and the muffler.

The construction throughout this ARF is exceptional; there aren't any warps, twists, or waves, and the quality of the materials used is well above average.

■ **Radio.** Five servos (2 for the ailerons, and 1 for the throttle, rudder and elevator) are recommended, but I used 1 servo for each aileron, so I ended up using 7 servos. Radio installation is simple, and there's a lot of room inside the fuselage for these components. I used my Airtronics RD6000 Super system and opted for Airtronics 738 servos on the ailerons, rudder and elevator and a basic 102 servo for the throttle.

A plywood tray is provided for the rudder, elevator and throttle servos. The aileron servos fit on plywood trays in the wings; pull strings are taped into place to pull the servo leads to the center of the wing. The receiver and battery are mounted in foam and then rubber-banded to a tray in front of the servos. I ran the receiver antenna through the installed tube inside the fuselage.

Wire pushrods are used for all connections. The elevator and rudder pushrods run inside the aft fuselage through installed nylon tubing. The elevator's pushrod forms a Y shortly past the servo and splits into each elevator half. I soldered this joint instead of using the two provided wheel collars.

All the engine-cowl screws are recessed but are easy to get to with a ball-end driver; this provides a clean appearance.

Super Stearman—bulging biplane biceps

What do you get when you more than double the horsepower of any airplane? For one thing, you get much bigger grins every time you move the throttle forward for takeoff. The 450 Stearman—the so-called "Super Stearman"—is a classic case in point.

Originally born with a puny 220hp, W-670 Continental radial in its nose, the airplane takes on an entirely different personality when given a "nose-ectomy," and an R-985 Pratt & Whitney with 450 fire-breathing horses is grafted on. The leisurely schoolmarm that's intent on teaching a military cadet the basics of aviation becomes a belligerent showoff that's eager to demonstrate what it can do.

The 450 Stearman had to happen. Right after WW II, thousands of Stearmans and BT-13 Vultee trainers were available at bargain-basement prices. Though under-powered, the Stearmans were ideal for crop-dusting, but the Vultees were not much good for anything. The BT-13s did, however, have a 450hp P&W and prop up front that were worth the entire price of the airplane (generally, about $400). The conclusion was obvious, so ag operators snatched many of the old BTs up, yanked off the engines, pushed the carcasses off to the side and ignored them. For years, cannibalized BT-13s littered grassroots airports nationwide.

The airshow guys were right on the heels of the dusters, but they went the ag operators one better: they wanted to improve the airplane's roll performance as well as its ability to climb, so they installed an extra set of ailerons on the top wings and slaved them to the bottom wings. Then the old airplane could not only leap off the ground and have a modicum of vertical performance, but it could also actually roll with the best of them—sort of. The stodgy old schoolmarm had been turned into a rock 'n' rollin' circus performer.

From a pilot's point of view, you have to have flown a stock Stearman to appreciate the dramatic improvements that the airshow types have made to the airplane. Flying aerobatics in a stock Stearman is a continuous, irritating cycle—nose down, down, down, wait, wait, now pull. Do one maneuver, then climb, climb, climb to replace the altitude lost.

Whereas an original 220hp Stearman spends a lot more time diving to gain energy and then climbing for altitude than it does doing aerobatics, the 450hp bird has almost all the energy it needs bolted to its nose. It needs only a gentle nod down before it's ready to be pulled up into whichever maneuver its pilot desires. So when you see John Mohr doing his airshow routine in a 220hp Stearman, you know you are seeing one of the very best aerobatic pilots in the world because his airplane isn't doing a single thing to help him.

The extra ailerons do wonders for the airplane in rolls. Not only are the forces lighter (a stock Stearman is a "manly" airplane), but the roll rate—although not that of a Pitts or an Extra—is such that it lets the aerobat do point rolls or anything else around the longitudinal axis with no danger of tearing a rotator cuff.

The Super Stearman is called "super" for a reason; if it weren't, it would be just another Stearman, and the grin factor wouldn't be nearly as high.

—Budd Davisson

Visit Budd on the Web at airbum.com.

The wheel pants and landing gear are very sturdy. Notice the small screws that help to prevent the pants from rotating out of position.

If you decide to use 2 aileron servos, the top ailerons can be connected to the lower ones with a scale aileron connecting rod. I used 4 servos for maximum aerobatic performance and didn't need the aileron connecting rod. To connect the upper wing's male servo lead, I installed an Ernst charge receptacle behind the cabane strut that secured the female end of the servo lead. You'll need two Y-connectors and 18-inch-long extensions for each aileron servo.

For balance, I added 8 ounces to the Super Stearman's nose. A plywood box that's permanently attached to the top of the engine mount with wood screws houses the weight. I had excellent results using the recommended control throws.

■ **Engine installation.** I powered my model with an O.S. Max 1.20 4-stroke (mounted inverted) and its stock muffler. For those who seek a less expensive powerplant, the SuperTigre 90 2-stroke is a good choice. I also used a Zinger 15x8 wooden propeller. The provided 2½-inch polished-aluminum bullnose spinner and adapter nut fits the O.S. Max 1.20 perfectly. I also used a Du-Bro Kwik Fueler valve.

FINAL DETAILS

Two aluminum N-shaped outboard wing struts are needed for flying. The top front of each strut is marked with an arrow for easy installation. Two very detailed pilot busts, cockpit coaming and windshields are provided. Paint the cockpit interior with flat-black paint and then add the instrument-panel decals. I used silver-coated elastic string from a craft store to simulate flying wires. Although rigging material is not included in the kit, the instructions detail its installation.

The kit comes with this scale bullnose aluminum spinner and the vacuum-formed dummy radial engine shown here installed in the engine cowl's opening.

I expect a lot from most contemporary scale ARFs, but the Great Planes Super Stearman exceeded my expectations. I enjoyed its speed of construction, exceptional flight and outstanding looks. This plane is definitely a cut above the rest. ✈

Airtronics *(714) 978-1895; airtronics.net.*
Du-Bro Products *(800) 848-9411; dubro.com.*
Ernst; *distributed by Tower Hobbies.*
Great Planes Model Mfg. Co.; *distributed by Great Planes Model Distributors (800) 682-8948; (217) 398-6300; greatplanes.com.*
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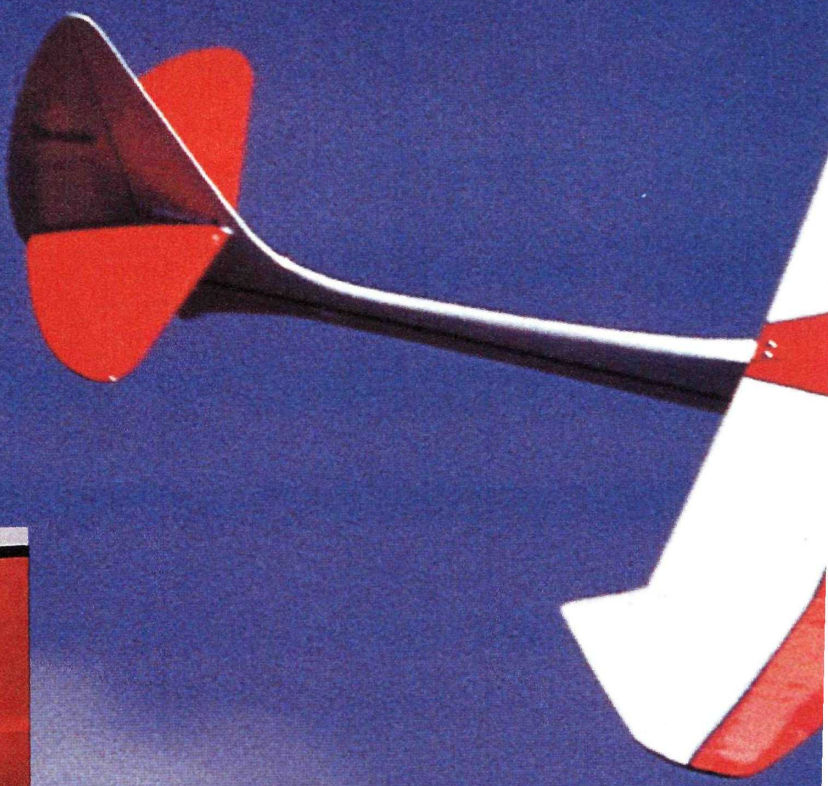
Zinger; *distributed by J&Z Products (310) 539-2313; zingerpropeller.com.*
Z-Poxy; *distributed by Zap Glue; zapglue.com.*

Repair leading-edge damage

This simple fix will get you airborne again

by Dave Garwood

The song says, "You only hurt the ones you love," and the more we fly our favorite planes, the more we expose them to damage. Landing my Dynaflite Bird of Time sailplane, I dinged a wing leading edge. Dang me! Here's how to fix this common type of damage to a balsa wing.



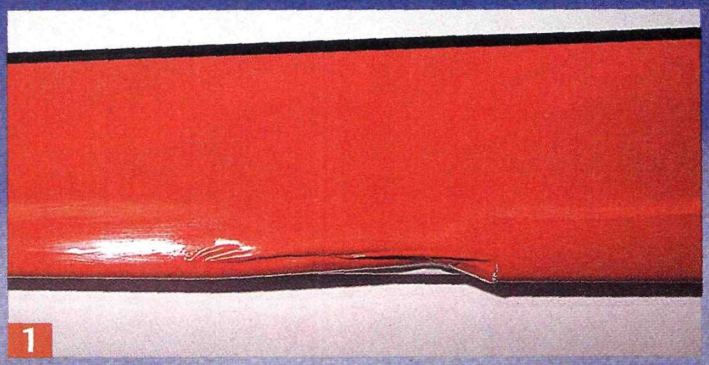
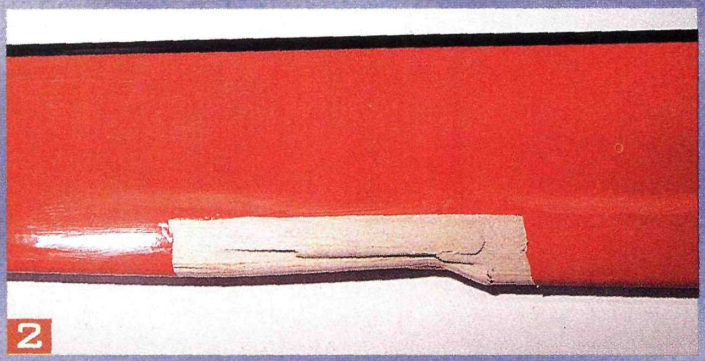
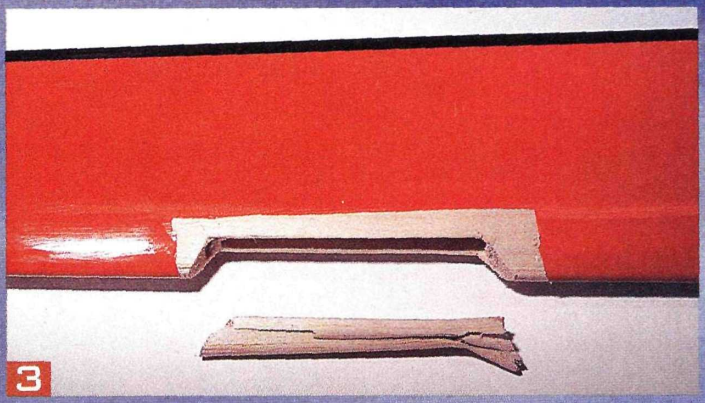
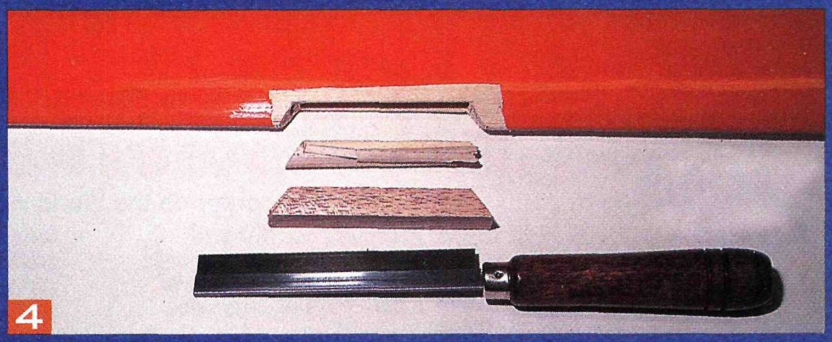


Photo 1 shows the damage to the balsa leading edge with the covering on. Photo 2 shows the leading edge after I had carefully removed the covering by slicing it gently with a new razor blade and then carefully peeling it from around the damaged area. Wing-structure components to be removed include the balsa leading edge and some of the Vie-inch balsa sheeting.

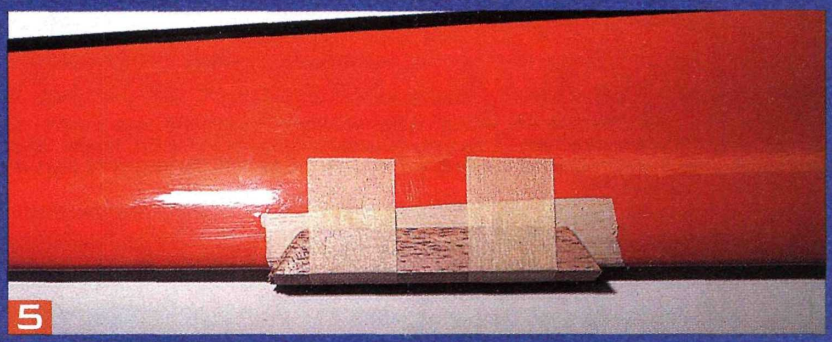




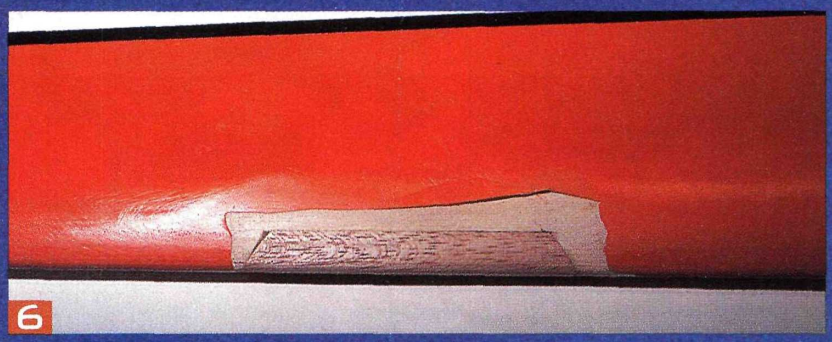
Here, I've cut out the damaged area. 1 made the diagonal cuts with a razor few and used a hobby knife guided by a metal straightedge to make the p i g cuts. You'll obtain the strongest repair if the new part spans from rib to rib. Make diagonal cuts so there's a greater surface area for gluing in the new part. Clean up the cuts with a sanding block, if necessary.



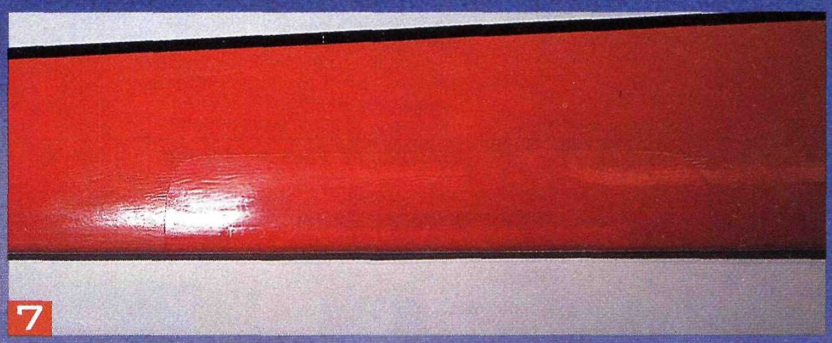
Here is the damaged section that I cut away and the small piece of scrap balsa that I shaped to roughly match the repair area. To minimize gaps and the quantity of glue needed to secure the part, take your time with the final shaping of the repair piece. Remember: excess glue adds unnecessary weight.



The repair piece has been taped into place. **I** used **Titebond** carpenter's wood glue and let it dry overnight.



The replacement piece has been carved to shape and sanded flush with the rest of the wing's leading edge. I then covered the repaired area with MonoKote heat-shrink film to match the original covering. This method restores the shape and strength of the original wing structure, and the repair is difficult to see from more than a couple of feet away.



Voilà! Almost as good as new. 4-

Dynaflite; *distributed by Great Planes Model Distributors.*
Great Planes Model ***Distributors*** *(217) 398-6300; (800) 682-8948; greatplanes.com.*
MonoKote; distributed by Great Planes Model Distributors.
Titebond; distributed by Franklin Glue; franklinghie.com.

ENGINE REVIEW

SAITO FA-82a

BIG POWER IN A SMALL PACKAGE

by C. David Gierke

More than 20 years after it introduced its first 4-stroke, the FA-30, Saito is considered one of the world's top producers of high-quality 4-stroke powerplants. This tradition continues with the latest addition to the line: the FA-82a.

ENGINE HIGHLIGHTS

- Ideal for scale applications.
- Superior cooling.
- Outstanding power per pound.
- Lightweight–just 16.3 ounces!
- Rear-positioned glow plug for safe starts.

specifications

ENGINE: Saito FA-82a

DISTRIBUTOR: Horizon Hobby Distributors

DISPLACEMENT: 0.820ci

BORE: 1.14 in.

STROKE: 0.802 in.

GLOW PLUG: Saito SS SAIP 400S

SHAFT NOSE THREAD: M7x1 (ISO)

CARBURETOR CHOKE BORE: 0.315 in.

WEIGHT: 16.3 oz.; 17.6 oz. w/muffler

PEAK TORQUE: 165.5 oz.-in. @ 6,300rpm

PEAK HP: 1.4 @ 9,700rpm

FUEL USED: 10% nitro, 20% oil (author's blend)

PRICES: $255; $280 (Golden Knight, above)

FEATURES: one-piece cylinder barrel and head; sleeveless cylinder-barrel design; true AAC (aluminum barrel, aluminum piston, chrome-plated barrel) design; composite-plastic backplate; twin-ball-bearing crankshaft support; diecast piston with Meehanite compression ring; adjustment wrenches; expansion muffler.

The Saito .82a, with its single-piece cylinder barrel and head, has outstanding power for its size and weight compared with other 4-strokes. By eliminating the conventional cylinder sleeve (liner), Saito's ringed, high-silicon aluminum-alloy piston rides directly within its chrome-plated, pressure-diecast aluminum cylinder barrel. This true AAC (aluminum barrel, aluminum piston, chrome-plated barrel) system closely matches the piston's expansion to that of the cylinder barrel for great performance and longevity.

Another plus of Saito's integral cylinder/head system is its superior heat-transfer qualities. With its sleeveless design, there are fewer interfaces between combustion gases and the outside air, providing better cooling performance than that found in engines with "drop-in" sleeves (in which heat must move from the piston to the inside of the sleeve, to the outside of the sleeve, to the inside of the cylinder barrel and, finally, to the exterior of the cooling fins).

DESIGN FEATURES

The exterior of the Saito .82a reveals exquisite, aluminum-alloy pressure diecastings and a composite plastic backplate. The one-piece cylinder barrel and head are mounted on the crankcase with four machine screws. The glow plug is positioned in the cylinder head so that it faces the rear—an important safety feature, considering the rapidly rotating propeller!

The valve-train components (cam gear, tappets, cam-gear housing, pushrods and pushrod covers) are at the front of the engine in traditional Saito fashion. The fuel-metering, 2-needle-valve updraft carburetor has eliminated the choke valve. Saito states, "Due to the excellent fuel-draw characteristics of the Saito engines, the use of the choke was determined not to be necessary." The engine (minus muffler) weighs 462 grams (16.3 ounces), so it's very light for its displacement.

The FA-82a is also available in a "Golden Knight" version with a glossy black finish and gold valve covers.

PHOTOS BY C. DAVID GIERKE

The integral cylinder barrel and head are shown with rocker arms, valves and return springs installed.

■ **Internal components.** Twin ball bearings are fitted to the crankshaft for support; the front bearing is a 23mm unit that is sealed front and rear. The rear, 27.6mm bearing is fitted with a rear shield. A breather nipple is below the cam gear (under the crank), ensuring adequate lubrication to the cam, tappets and pushrods. Some lubrication (provided in the fuel) blows past the piston ring from the combustion chamber and into the crankcase, where it is pumped by the reciprocating action of the piston throughout the crankcase, finally exiting through the breather.

■ **Sleeveless cylinder barrel.** The integral cylinder barrel/head represents significant challenges in die-sinking and pressure diecasting, along with chrome-plating and blind-bore honing technologies! Bronze valve guides and seats are machined and press-fit into the cylinder head, providing an excellent seal and long operation. If I could speak with Saito engineers, I would offer one constructive criticism and a suggestion concerning their otherwise magnificent cylinder barrel/head: because the glow plug doesn't protrude completely through the head, several threads from the tapped hole form rough edges, making the combustion chamber prone to pre-ignition owing to potential hot spots. By

continued on p. 103

The crankcase with the cylinder barrel, gear case and crankshaft removed.

Close-up of the rocker arms, valve stems and return-spring details with the rocker covers removed.

PROPS & POWER

MAKING POWER

Like most 4-stroke engines, the Saito FA-82a produces its best torque at very low rpm: 165.5 oz.-in. @ 6,300rpm (see point "A" in the graph below). That's 2,000rpm less than the largest propeller tested (an APC 14x8)! Although the engine can theoretically turn larger propeller loads into the mid-6,000 through 7,000rpm range, overheating and detonation might become problems. Evidently, Saito thinks so as well; a 14x8 APC is the largest flying propeller it recommends. Nevertheless, the .82a still produces 1.3 brake horsepower (bhp) while turning the 14x8 propeller at 8,200rpm (point B)—impressive!

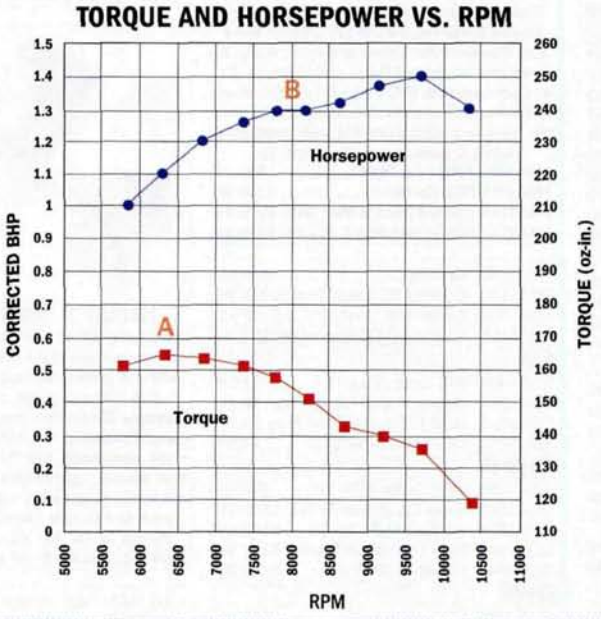
READING THE GRAPH

To determine the torque and horsepower values generated by a prop, find its rpm on the "Torque and horsepower vs. rpm" graph, then draw a line vertically through the torque and bhp curves. Transfer the points of intersection to the scales on the right and left to determine torque and brake horsepower.

MORE POWER AVAILABLE

Although I didn't have time to evaluate the engine with higher percentages of nitromethane (Saito recommends using up to 15 percent), I have a suspicion that the engine will produce close to or in excess of the 1.5 bhp that the manufacturer claims. It's nice to find truth-in-engine-performance advertising!

After break-in and dyno testing, I checked the engine for idle and its transition to wide-open throttle. With the exception of a minor lean condition of the low-speed needle valve (¼ turn) from the factory-set position, the engine idled at a consistent 2,100rpm and exhibited a crisp throttle-up after a 30-second idle. The sound level was a quiet 89 dB @ 8,200rpm and 91 dB @ 9,500rpm.



Peak torque: 165.5 oz.-in. @6,300rpm
Specific torque: 201.8 oz.-in./ci
Peak power: 1.4 @ 9,700rpm
Specific power: 1.7 bhp/ci
Power/weight: 1.37 bhp/lb.
(Peak = maximum reading; specific = compared to engine displacement, i.e., oz.-in./ci or bhp/ci)

PROP RPM

Size*	Rpm
11x11	10,550
12x8	10,350
13x7	10,150
12x9	10,050
11x10	9,950
13x8	9,900
▶ 12.5x9	9,500
14x6	9,150
12x10	8,950
13x9	8,850
15x6	8,300
14x8	8,200

*APC props used in test.
▶ Best performance

TEST CONDITIONS

Temp.: 75 deg. F
Barometer: 29.04 in. Hg
Wet-bulb temp.: 69 deg. F
Bhp correction factor: 1.068

continued from p. 99

counterboring the bottom of the glow-plug hole prior to bottom-tapping the ¼-32 thread, the extended nose of the 4-stroke plug could be made to form a smooth transition with the hemispherical combustion chamber.

■ **One-piece crankshaft.** The crankshaft is machined in one piece, including the crankpin and integral pinion gear for valve-train actuation. Shaft nose threads are M7x1 (metric). The piston is produced from another diecasting; it contains a single, non-pinned Meehanite (fine-grain cast iron) compression ring. The wristpin (free-floating variety) contains Teflon end pads. The connecting rod is made of a forged aluminum alloy; there are no bronze bushings on the wristpin or crankpin ends of the rod.

The cam-gear housing contains the cam gear and cam-gear shaft. The cam-gear shaft is immobilized within the cam gear by a single setscrew from the front of the gear housing. The cam gear's intake and exhaust lobes are centered within the cam housing by two steel washers on the cam-gear shaft. The bronze tappet (lifter) guides are pressed into place on the top of the cam-gear housing. The housing is attached to the crankcase with four machine screws.

■ **Drive components.** The Saito FA-82a is a pushrod-actuated, poppet-valve engine. Besides the half-speed camshaft that is driven from the crank, the system components consist of two hardened and ground tappets; two hardened and ground pushrods; two steel rocker arms with machine-screw rocker-arm pivot pins; and two alloy-steel poppet valves with return springs and steel retainer washers. The rocker-arm brackets that retain the rocker arms via the pivot pins are part of the cylinder barrel/head diecasting. The chrome-plated, diecast aluminum-alloy rocker-arm covers are held in place by two machine screws. The covers are sealed to the head by two paper gaskets. An adjustment screw and locknut allow the user to manipulate the valve lash (clearance between the end of the valve stem and the rocker arm). Saito provides a 0.004-inch (0.10mm) feeler gauge for this adjustment, along with the appropriate Allen wrenches. The pushrods operate within steel tubes (covers) that are sealed at both ends by synthetic rubber endcaps.

Piston, connecting rod and wristpin assembly; note the single compression ring and Teflon end pads for the wristpin.

The Saito .82a is a superbly designed and made engine ...

■ **Carburetor.** The twin-needle-valve, fuel-metering carburetor has a diecast aluminum-alloy housing with a hardened and ground steel throttle barrel. Fuel-jet components are made of brass and have been fitted with typical Saito precision. The intake manifold connecting the carburetor to the cylinder head is made of a chrome-plated brass tube; it is sealed with an O-ring at both ends to ensure leak-proof operation. The composite-plastic backplate also serves as the carburetor mount; it doesn't require a sealing gasket or an O-ring.

■ **Included muffler.** The Saito .82a's muffler is a very sturdy unit that consists of an expansion-chamber housing, an endcap with an internal baffle, a capscrew and nut, a threaded manifold and two jam nuts. A pressure fitting that's threaded into the expansion chamber portion of the muffler provides exhaust-gas pressure to drive the fuel-delivery system. This new assembly supercedes the older muffler-manifold-locknut system that often came loose during engine operation.

The gear case with the camshaft and timing gear exposed.

Front view of the gear case; note the bronze lifter guides at the top of the casting.

BREAK-IN

With the throttle set at about ⅓ open, you may use a chicken stick or an electric starter to initiate engine operation. The Saito engineers suggest that you use a very rich, high-speed needle-valve setting for the first 10 minutes to maintain cool and oily conditions. During this period, the rpm should be adjusted (but not to exceed 4,000) with the carburetor's throttle; connect a pushrod to the throttle arm for this. Glow-plug heat should be maintained to help prevent an inadvertent flameout.

After the first 10 minutes of operation, advance the throttle to wide open. With the APC 13x7 break-in propeller, the engine should be needled to run at about 6,800rpm—a fairly rich setting. Run it five times at this setting (2 minutes at a time), and allow the engine to cool between runs. Continue to operate the mill for 2-minute bursts while gradually leaning the primary (high-speed) needle valve. Use a tachometer to determine the engine's peak rpm. Richen the needle valve (counterclockwise)

One-piece crankshaft with integral pinion (timing gear) machined in place.

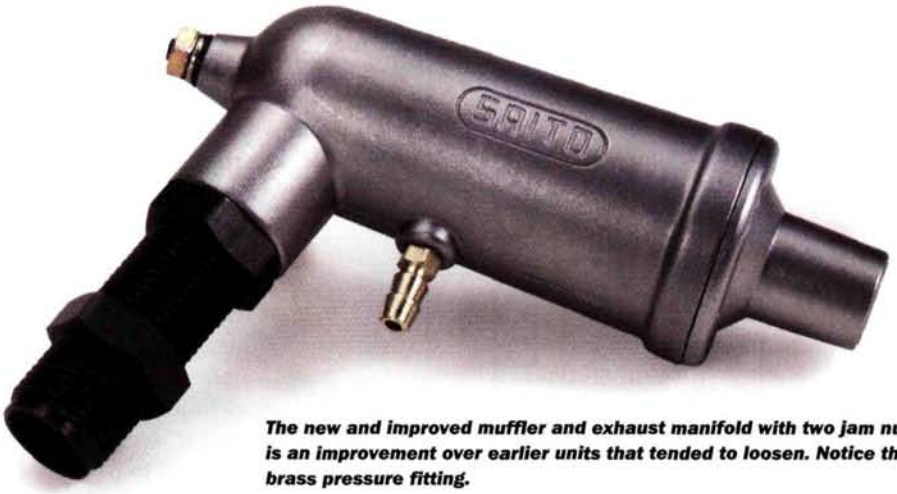
pro tips

I always break in new engines on the test stand because it offers the opportunity for close-up observation and adjustments while isolating the engine from potentially harmful dust and dirt. Here are some suggestions from the Saito instruction manual:

- Use the fuel intended for flight operation.
- Use the supplied Saito SS SAIP 400S glow plug.
- Install one of the suggested flight propellers (I used an APC 13x7).
- Prior to the first start-up, set the primary needle valve at 2½ turns counterclockwise from closed.
- Don't adjust the low-speed needle valve at this time; it has been adjusted at the factory for break-in conditions.
- Use a tachometer to set the high-speed needle valve.
- Secure the propeller nut; use the second anti-loosening jam nut.
- Be certain that the muffler is installed properly by oiling the threads before you insert the muffler into the cylinder head (this helps to prevent thread galling).

until the rpm drop to about 200 to 300 less than peak; this is close to your ideal in-flight setting. After running for 45 minutes (the minimum break-in time that Saito recommends), the engine should run smoothly and steadily. If it doesn't, more break-in time is required to seat the piston ring to the chrome-plated cylinder.

The carburetor and intake manifold assembly; this is a twin-needle-valve, fuel-metering unit.



The new and improved muffler and exhaust manifold with two jam nuts is an improvement over earlier units that tended to loosen. Notice the brass pressure fitting.

Above: the Saito .82a running at wide-open throttle on the break-in stand. Right: the engine test stand with support equipment. Note that the engine has been removed from potential sources of dirt and dust.

NORMAL OPERATION

The instruction manual is comprehensive and complete. It covers carburetor adjustment and maintenance, valve/tappet adjustment, troubleshooting, a propeller selection chart and more. Saito suggests the following for normal engine operation:

- Don't operate the engine with a lean air/fuel mixture.
- After 1 or 2 hours of running, you may need to adjust the poppet valves.
- Regularly check all screws and nuts on both the engine and the muffler.
- Use a length of silicone tubing attached to the crankcase breather nipple to direct excess oil away from the airplane.

SUMMING UP

The Saito FA-82a is a superbly designed and constructed engine; only the best materials and processes have been used in its manufacture. Its ringed AAC piston and cylinder represent cutting-edge technology for controlling component clearances throughout the wide range of engine temperatures, from wide-open throttle through idle and back again. By eliminating the cylinder sleeve, Saito has also reduced the number of component interfaces between the piston and ambient air; this greatly improves the engine's ability to cool efficiently. ✈

APC Props; *distributed by Landing Products (530) 661-0399; apcprop.com.*

Saito; *distributed by Horizon Hobby Distributors (800) 338-4639; horizonhobby.com.*

SOUTHEAST ELECTRIC FLIGHT FESTIVAL

A Southern-style electric fun-fly

by Rick Bell

Gary Wright flew this Cermark Pitts in the noontime demo. A Hacker C50 14XL brushless motor and a Thunder Power 10S4P Li-poly battery power the 14-pound model. It certainly didn't lack power!

You need four things for a successful fun-fly event: a great venue, favorable weather, good organization and lots of enthusiastic participants. This year's Southeast Electric Flight Festival (SEFF) wildly succeeded on all counts! Hosted by the Fayette Flyers of Atlanta at Hodges Hobbies field in Americus, GA, June 17 through 20, this all-electric fun-fly is fast becoming the premier must-attend event for e-flight enthusiasts. In its third year, SEFF had the largest turnout yet—282 registered pilots from more than 30 states, Japan and Great Britain. They brought hundreds of models to fly, and fly they did—despite the high heat and humidity. The 2005 SEFF is scheduled for the end of April when the temperatures are somewhat cooler. Good move!

Quique Somenzini shows off a little and hovers his new Fiesta with only one hand on the transmitter. He makes it look easy!

PHOTOS BY RICK BELL

SOUTHEAST ELECTRIC FLIGHT FESTIVAL (SEFF)

Left: Horizon Hobby's product designer Mike McConville readies a mini Funtana for flight. This new model generated lots of interest.

Below: Hugh Thomas and Jeff Guisinger show off their very large foamie before its first flight. It's built mostly of Dow Bluecor fan-fold insulation and a little wood; it weighs 13.6 pounds. An Axi 4120/14 geared 2:1 and powered by a 16-cell, 170mAh Ni-Cd provides motivation. Its first flight was a success.

Above: electric jet models were popular, and one of the most spectacular was Chris True's A10. He built it from Model Airplane News plans and extensively modified it for electric propulsion.

Left: Bob Belluomini's Jepe F-16 makes a low pass at more than 100mph! A Jepe 90mm Spider fan and an Irate 5S2P Li-poly battery give the Falcon its punch.

The venue is owned by Mac Hodges, and it is one of the most spectacular that I've ever seen for any modeling event: a closely cropped, flat, 1,700-foot-long grass runway that's wide open on all sides with a full-service hobby shop right at the site. Talk about going to heaven!

The most important part of any fun-fly is, of course, the flying. There's no point of going to a fun-fly unless you get in plenty of flying. And this is where SEFF excels. The vast flightline was separated into three flight areas: park flyer, 3D and sport flying. The overwhelming majority of pilots thought the three flight zones were an improvement over last year's, and there were plenty of models in the air at any given time.

HAPPENINGS

Like other fun-flys, SEFF offers many things to see and do. You can visit vendors and participate in organized events. There's also a huge raffle with $12,000 in prizes and awards. Everybody went home with something, whether it was a modeling product, a hat, a T-shirt, or some other goodie. SEFF encourages manufacturers to introduce new products at the fun-fly, and the pilots vote on which is best. The winner has bragging rights for a year and also garners the coveted SEFF trophy. Other awards include Pilot's Choice and Largest Sport Plane.

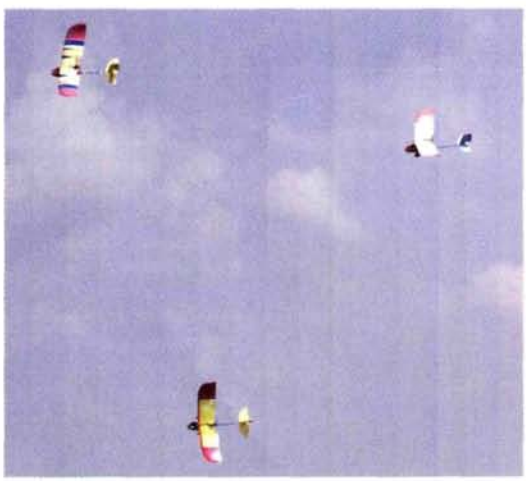
Some of the other happenings were a daily noontime demo by the JR Show team, with such notables as Quique Somenzini, Mike McConville, George Hicks, Peter Goldsmith and Steve Rojecki. Pilots extraordinaire Gary Wright, Jason Shulman, Dave Payne and Bob Belluomini were also present to strut their stuff. They flew everything from a 33-percent Extra to an electric ducted-fan jet that cooked along at 120mph. On

CHAMPIONSHIP SOARSTAR PYLON RACE

ON SATURDAY AFTERNOON, the highly anticipated Soarstar/Wingo races took place. The 200-foot racecourse had a pylon on each end. Each heat consisted of 8 laps, and the top two finishers of each heat advanced to the championship race. Though racing around a 200-foot course may not sound like a long distance, the racers will tell you otherwise. To keep the speeds down and the playing field level, the models had to be flown with 6V Speed 400 motors and powered by an 8-cell Ni-Cd or NiMH battery; Li-poly batteries were off limits. To make things interesting, each contestant had to perform two loops during the race.

Each heat had four pilots, and the planes were hand-launched to start the race. The races were quite exciting with many close heats and Wingos flying everywhere. As with any race, collisions are bound to happen, and the Wingos weren't immune. The slow-motion midairs were spectacular! After the dust and foam pieces had settled, Nick Defilici reigned victorious. A great time was had by all.

All heats were started by hand-launching the planes.



Left: three Wingos jockey for position during the Soarstar Championship Flyer race.

Right: one of the more dramatic moments during a race.

Event coordinator Jeff Meyers gives last-minute pilot instructions. He and his crew did a great job running the event.

The Horizon Hobby guys debuted the ParkZone F-27 Stryker at SEFF. Powered by a Speed 480 motor, the flying wing's performance was excellent.

Doug Holland displays his Jim Walker 404 Interceptor that he modified to RC. It uses a magnetic actuator for the rudder and a tiny Li-poly battery for power. Its all-up weight is 24 grams.

Model Airplane News "Powerlines" columnist Greg Gimlick flew his converted Great Planes Stuka. It looks great in the air.

A MOST GRACIOUS HOST

Mac always thrills the crowd when he makes a low inverted pass with the B-29.

MOST PEOPLE don't know who Mac Hodges is, but they have seen him perform at premier events such as Top Gun and Joe Nall. Does a giant, 20-foot-span B-29 launching a rocket-powered X-1 sound familiar? Mac's the guy who wiggles the sticks for these breathtaking flights. A lifelong modeler, Mac owns a piece of farmland that he has worked for many years. To make his farming duties a little easier and more fun, Mac learned to fly and got into crop-dusting; he then carved out a runway for his plane, which also served his modeling activities well. He also opened a hobby shop to feed his habit, and since there weren't any other such shops, Mac began to fill orders for his friends, and from there, the business really took off.

Above: the man himself, Mac Hodges, enjoys a laugh.

Left: the Bell X-1 starts on another rocket-assisted flight up to altitude; in just a couple of seconds, the X-1 climbs several hundred feet.

Saturday, the crowd was treated to a full-scale Pitts Special flown by George Hall doing beautiful aerobatics, smoke and all. On Thursday, the new Limited Motor Run Sailplane contest took place. It was well received and will be back next year.

By far the most unusual event was the World Championship Soarstar Pylon Race. If you aren't familiar with the Super Flying Models Soarstar or its brother, the Kavan Wingo, they are high-wing foamies that have a gondola-type fuselage and a motor that's mounted in a pusher configuration. These planes are designed for beginners, and that's what makes the races a lot of fun; they're slow and easy to fly, so anyone can compete.

ACCOLADES

Of course, an event the size of SEFF couldn't happen without the generosity of the many sponsors who donate cash and prizes. A big thank you to primary sponsors Horizon Hobby, JR and *Quiet Flyer* magazine as well as to the many manufacturers that participated. And the biggest thank you goes to Mac Hodges—a gracious host—for providing a fabulous flying site.

SEFF AWARDS

THREE VERY SPECIAL AWARDS are given out at SEFF each year, and they are somewhat unusual: the event's Best New Product released, the Largest Sport Plane and Pilot's Choice. The Best New Product and Pilot's Choice are determined by the contestants' votes on the coolest new product, and the pilot's choice is presented to the participant whose flights were the most impressive.

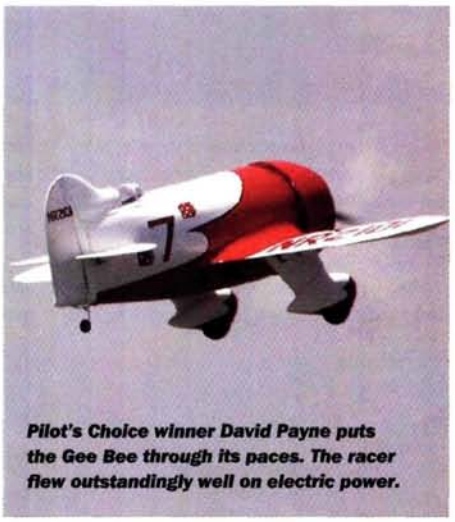
☆ **HOBBY LOBBY** won Best New Product with its Hell Raiser 3D, a 3D-capable bipe constructed of Depron foam.

☆ **DAVID PAYNE** nailed the Pilot's Choice award with his awesome-flying Gee Bee. An Axi 2120/18 outrunner running on a Kokam 5S2P Li-poly battery motivated this 61-inch-span speedster. "Fast and smooth" is the best way to describe the Gee Bee.

☆ **THE LARGEST SPORT PLANE AWARD** is determined by a points system. The total power plus the wingspan minus the model's weight determines the winner. Bill Mixon with his own-design Super Classic came out on top. His model spans 16 feet 9 inches and weighs 14.5 pounds. Powered by a Hacker C50 Acro XL and 20, 2600mAh NiMH cells, its performance was very graceful. The model cost less than $100 to build, and he covered it with a painter's drop cloth. Who says that a large model has to be expensive?

Left: Bill Mixon was the recipient of the Largest Sport Plane award, and here you can see why.

Below: Hobby Lobby's Jim T. Graham poses proudly with the SEFF Best New Product winner, the Hell Raiser 3D.



Pilot's Choice winner David Payne puts the Gee Bee through its paces. The racer flew outstandingly well on electric power.

Above: no, it isn't a model but the real thing! George Hall lands his Pitts Special after putting it through its paces and thrilling the crowd.

Right: there were plenty of vendors to check out at SEFF.

FINAL THOUGHTS

The Southeast Electric Flight Festival is not to be missed. The site is wonderful, the people are very friendly, and the flying is superb. No matter what your interest in electrics, you're sure to find someone who shares it. The fantastic venue has plenty of airspace for many models to be airborne at the same time. If you break or crash your model, you can easily repair or replace it; just visit Mac's on-site hobby shop or one of the many vendors. The biggest concern was the heat and humidity. Fortunately, this is being addressed, with next year's SEFF to be held in late April. To event coordinator Jeff Meyers and contest directors Ernie Schlumberger and Ric Vaughn and the entire SEFF staff: a job well done, and I'll see you again next year!

The PROJEC

PHOTOS BY DAVE ROSELEN

The Projectile is a high-performance, electric-powered sport flyer that can do all of the AMA pattern maneuvers.

TILE

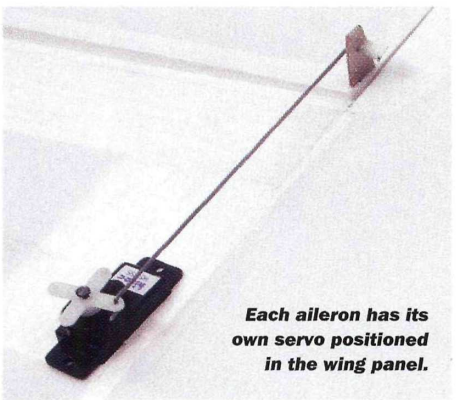
A high-performance electric sport aerobat

by Dave Robelen

A new generation of high-output brushless motors that have been combined with powerful new NiMH cells has opened the door to flight capabilities that rival those of glow-powered models. The Projectile is my latest effort to build a high-performance, compact electric model. To clarify what I mean by "high performance," my goal was to produce a model with the speed potential to easily fly on a breezy day and perform all of the moves in the AMA Aresti pattern. Since 3D maneuvers are not my "thing," I did not design the Projectile for them. My other goal was to produce a model that would be eye-catching on a busy flightline.

The first step was to identify a power system that would produce enough thrust and yet have a reasonable battery weight. For quite a while, I flew with a Mini AC brushless motor coupled to an MP Jet 3:1 gear drive, and that combination was clearly a good candidate for the Projectile. I chose an 8-cell, KAN 950 NiMH pack, and the combo spins an APC Slow Flyer 8x6 prop at 7,000rpm—quite adequate for the task. There are, of course, several other power systems that will work equally well.

For simplicity, the motor and gearbox are attached directly to the firewall without nose-cowl blocks. This saves weight as well.



Each aileron has its own servo positioned in the wing panel.

An electric model needs careful design treatment to keep its weight down and yet have adequate strength. I especially like to work with balsa frameworks, so finding a source of reliably light and true wood has been important. I have had very good experience with Superior Balsa. I decided to cover the Projectile with iron-on film, so again, keeping the weight low was a concern. Solite film from Balsa Products has worked very well for me.

As far as the plane's structure goes, the main areas of difference are in the wing and stabilizer. Again, I reached back to the 1960s for a design that featured a molded leading edge and open-frame stabilizer with a diamond airfoil. The rest was basically a matter of using the least material possible and not going crazy with the glue.

The model was shaped around the convenience of a low-wing design and all of the open access that it affords. With the wing on the bottom, the stabilizer mounted high, and the thrust line placed between the two, the model's handling is very smooth with neutral stability. The wing has just enough dihedral (IV2 inches under each wingtip) to bring the effective dihedral angle to zero, and the inset ailerons give an excellent roll rate. Tapering the wing produces a good strength-to-weight ratio and greatly improves the roll response. The modified NACA 2415 airfoil ensures very low drag during both cruising and maneuvers.

How does it fly? Although I had some idea of what to expect on the first flight, I was still a bit shocked at its impressive airspeed and rate of climb. I had been a bit generous with the aileron deflection, so I had my hands full for the first couple of minutes. After a safe landing, I dialed in some aileron exponential and managed to figure out where the throttle stick was. The next few flights were the real payoff, and I began to work the bird through a full pattern sequence with power to spare. Smooth as grease, the Projectile responds "right now" to control inputs. You could call the Projectile a "park flyer"—as long as your park is the size of a football field! It moves right along. Want one? Let's do it!

specifications

MODEL: Projectile

TYPE: electric aerobat

WINGSPAN: 42 in.

LENGTH: 33 in.

WING AREA: 304.5 sq. in.

WEIGHT: 18.2 oz.

WING LOADING: 8.6 oz./sq. **ft.**

CONTROLS: rudder, elevator, throttle, ailerons

SERVOS: 4 Hitec HS-55s

RECEIVER: Berg 6-channel

ESC: MGM Compro TMM-25 brushless

MOTOR: Mini AC 1215/20 brushless w/MP Jet 3:1 gearbox

PROPELLER: APC Slow Flyer 8x6

BATTERY: 8-cell, KAN 950mAh NiMH

COMMENTS: the Projectile is a high-performance, compact aerobatic model that's capable of performing all the current AMA aerobatic pattern maneuvers in a limited space. The structure and styling are borrowed from the elegant pattern models of the 1960s. Although the Projectile's top speed is fairly fast (50mph+), it can be kept in a fairly compact area while maneuvering. Owing to its speed and responsiveness, the Projectile would not be a suitable model for a low-time pilot. For seasoned fliers, however, the Projectile is a true thoroughbred.

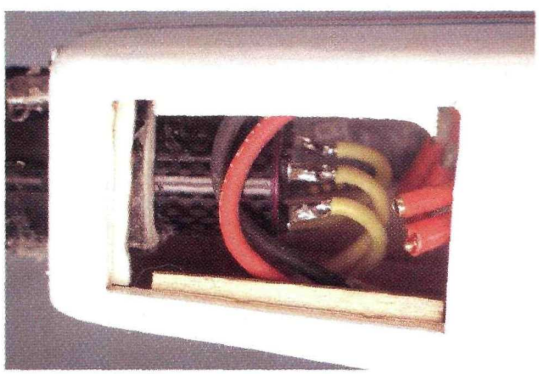
CONSTRUCTION

Round up a flat work board and all of the materials, and cut out all the parts ahead of time. The wing is a good starting point, as it will come in handy as a guide when you must trim the fuselage's wing-saddle opening to fit. The wing should be built in two separate panels and butt-joined at the center when complete. Pin all of the bottom sheeting aft of the spars to the board (including the capstrips), then add the bottom spars and glue in the ribs. The center ribs should be tilted in slightly to match the dihedral. Add the top spars and install all of the sheeting aft of the spars. The ailerons are built as part of the wing and are popped loose after you've lifted the wing panels from the work board.

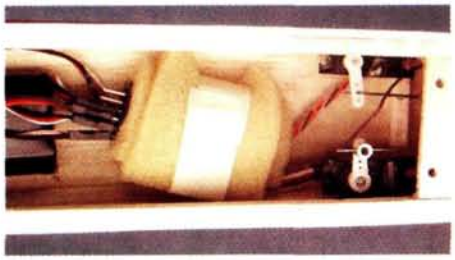
The leading-edge sheeting is nowhere near as tough as it looks. Spray some water on the outside surface along the centerline, and curl the sheet to a radius that's slightly tighter than the finished shape. A few strips of masking tape will help hold it until it has dried. I prefer to use wood glue when I install this sheeting; the extra working time it allows comes in handy. Finish adding the capstrips and the top sheeting, and the two panels are then ready to be joined. I did not use any center reinforcement, and my wing has held up fine. Cut, trim and fit the ailerons into place, and set the wing aside.

FUSELAGE

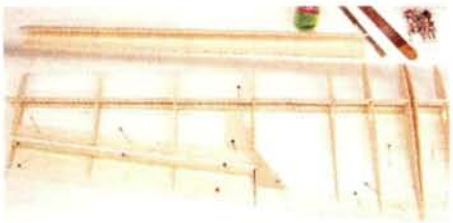
Cut the fuselage sides to shape and add the strips and fillers to each one. Join them with the crosspieces at the wing area



For access to the motor and ESC, this belly hatch is just in front of the main landing gear.



The radio compartment allows easy access to the radio gear.



Each wing panel is built flat on the workbench. They are then joined to complete the wing structure.

and carefully check the entire structure for squareness. Glue in the firewall; pull the tail ends together, glue them and then add the top sheeting. Clamp the landing gear to its plate and glue it into place. While the nose section is still open, fit the wing to the opening and drill through the hole in former F2 into the wing's leading edge for the alignment dowel. Now add the bottom nose sheeting and cut open the access hatch as shown. Round off the top and bottom fuselage edges. All of the wood you trim off is saved weight!

Build the stabilizer as shown and sand it to form its diamond-shape airfoil. I find it handy to finish the elevators before cutting them apart in the center. Add the wire joiner, and cut the elevator halves apart. While you have the stabilizer handy, trial-fit it to the fuselage; if necessary, trim the opening so that the stabilizer lines up with the wing. Cut the vertical tail parts, sand them to shape and set them aside.

FINAL ASSEMBLY

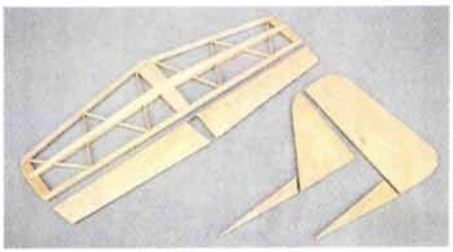
I was going to completely cover my model with Solite, but after doing the wing and horizontal tail, I chickened out and put MonoKote on the fuselage. It's my opinion that MonoKote is much easier to apply around compound curves. Hinge the ailerons and elevators using ¼-inch-wide strips of drafting Mylar in the indicated locations. Glue in the stabilizer, attach the vertical tail and hinge the rudder into place.

I chose to use 4 servos in my Projectile, but depending on which type you use, 4 could overload the ESC's BEC circuit. I have had very good results with Hitec HS-55s and a TMM-25 ESC. Make sure that the hinges and linkage can operate freely; this helps greatly in keeping the current draws down. To save the weight of several plug connectors, I cut into my aileron servo leads and extended them by soldering on commercial servo-lead wire. Be sure to stagger the solder joints and use heat-shrink tubing to insulate the wires.

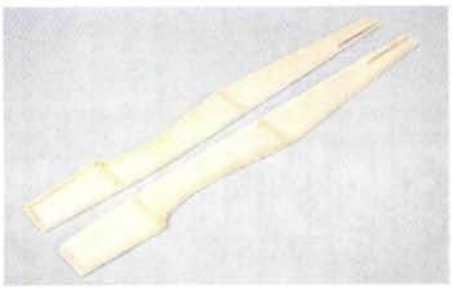
I used servo-mounting tape to attach the fuselage servos to their plywood mounting plates. The pushrods are 3/16-inch-square balsa with 1/32-inch wire ends. I soldered the ESC leads to the motor and passed the entire power system through the hole in the nose. I then fastened the gearbox into place with servo-mounting screws. Be sure to attach the APC 8x6 prop and place the battery in the fuselage before you balance the model. Move the battery around until the model balances as shown on the plan and then secure the battery.

Finish the model by forming a canopy out of pink foam (or similar material), and paint it with a couple of coats of black paint. It will look fine from 3 feet away, and the model will fly better with the added side area. Of course, if you wish to make a mold and form a plastic canopy, that would be great, too.

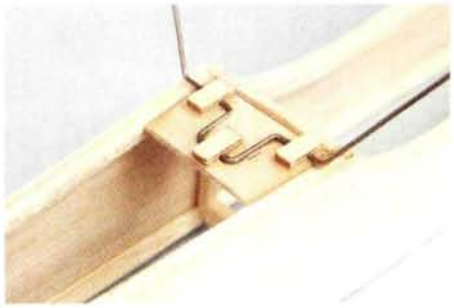
The ailerons are built as part of the wing and are later separated from the wing panels to form the control surfaces.



The tail feathers are light and simple to build.



The fuselage's side frames are straightforward.



As with the entire model structure, the main landing gear is simple, strong and lightweight.

The completed Projectile, ready to cover.

Charge the battery, and run through a control check; watch for binding or dragging linkage and then confirm that the motor runs in the right direction. With someone helping, perform a range check while running the motor at various speeds. I outfitted my model with a Berg 6-channel receiver, 4 Hitec HS-55 servos, a TMM-25 brushless-motor controller, a Mini AC brushless motor, an MP Jet 3:1 gearbox and an 8-cell, KAN 950mAh NiMH battery pack. For control, I used a Hitec Prizm 7X transmitter with a Spectra frequency module.

FLYING

The first consideration is to have ample flying space. A smooth runway surface is important, too. Expect the Projectile to be fast, and there will be no surprises. Get ample altitude before you experiment with maneuvers because it comes down fast, too! Its glide is fast and flat, with no vulgar habits during the landing flare. Snap rolls are a piece of cake, but the Projectile will not try this unless you call for it. If you experience a wing drop at low speeds, seal the aileron hinges with tape or a strip of covering material; a visible gap in that area is typically the culprit. Take your time learning new moves, and have a ball. I certainly have!

THE PROJECTILE
FSP1104

Designed by Dave Robelen, the Projectile is a high-performance electric aerobat that can perform all of the AMA pattern maneuvers. It uses lightweight balsa and plywood construction techniques and can trace its design back to the '60s. Several popular electric power systems can be used to power this great flying design.

WS: 42 in.; L: 33 in.: power: geared brushless motor; 1 sheet; LD 2. **$14.95**

APC Props; *distributed by Landing Products (530) 661-0399; apcprop.com.*

Berg; *distributed by RC Direct (858) 277-4531; rc-direct.com; and by DeeTee Enterprises (503) 692-6953; deeteeenterprises.com.*

Hitec RCD Inc. *(858) 748-6948; hitecrcd.com.*

MGM Compro; *mgm-compro.cz.*

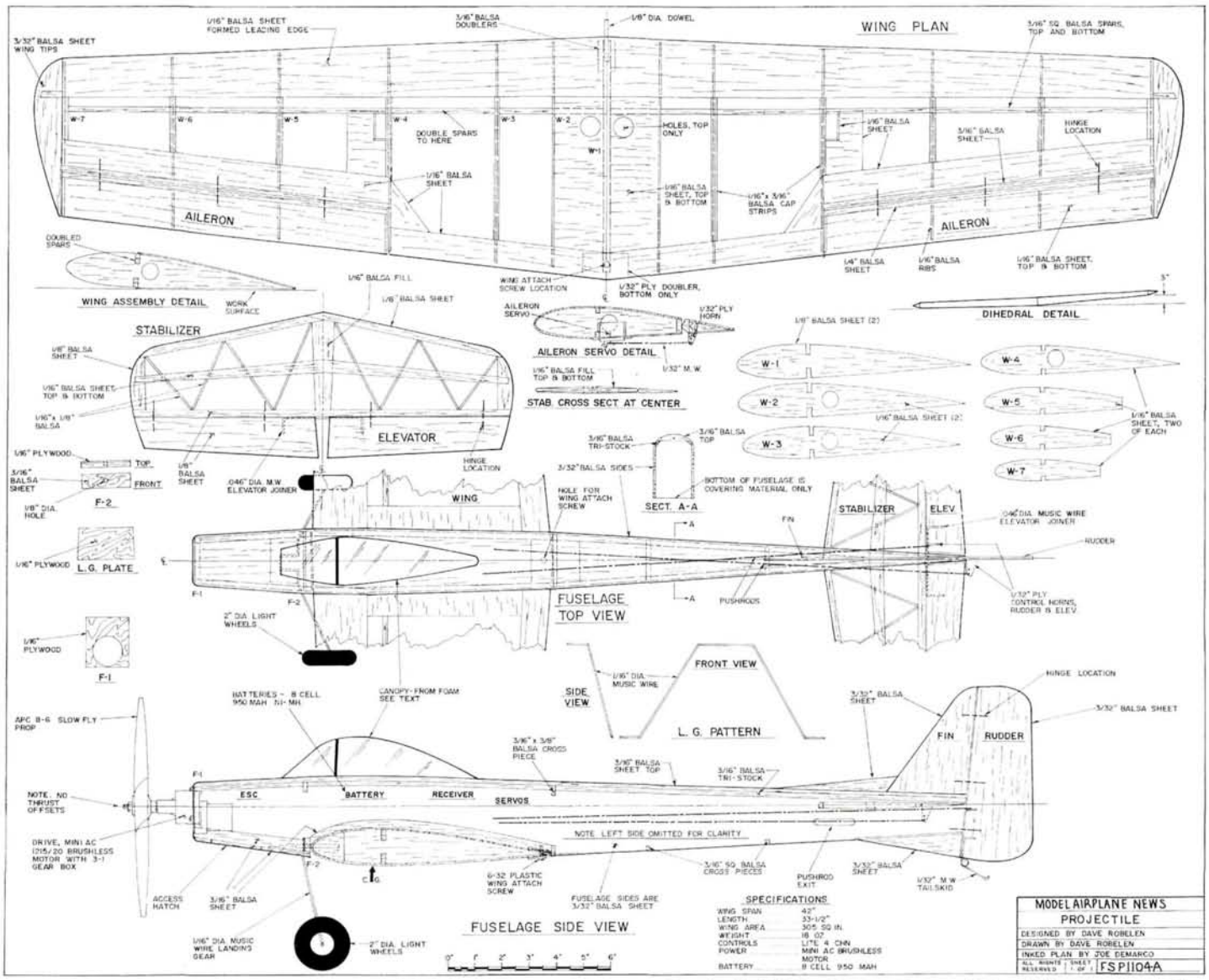
Mini AC; *distributed by Hobby Lobby Inc. (615) 373-1444; hobby-lobby.com.*

MonoKote; *distributed by Great Planes Model Distributors (217) 398-6300; (800) 682-8948; greatplanes.com.*

MP Jet; *mpjet.com.*

Solarfilm Lite (Solite); *distributed by Balsa Products (732) 634-6131; balsapr.com.*

Superior Balsa; *superiorbalsa.com.*



To order the full-size plan, turn to page 148, or visit rcstore.com online.

AT MODEL AIRPLANE NEWS, we not only tell you what's new, but we also try it out first so we can bring you mini-reviews of the stuff we like best. Manufacturers frequently send us their latest support equipment, and if we think a product is good—something special that will make your modeling experiences a little easier or just plain more fun—we'll let you know here. From retracts and hinges to glow starters and videotapes, look for it in "Product Watch."

Tamjets

Model TJ5 variable-pressure smoke system

Contrails for your turbine-powered jet

The perfect recipe for making a lot of dense, white, skip-free smoke is plenty of smoke oil and extremely high exhaust temperatures, but getting the oil into a jet's tailpipe takes a fair amount of hardware. Designed for turbine-powered jets, the Tamjets smoke system is a complete package that has everything you'll need to start making fluffy jet contrails!

The Tamjets Model TJ5 variable-pressure smoke system includes a high-quality motor and geared pump, a pump mount, a 7.2V battery pack, fill valve, shutoff valve, two T-connectors, 36 inches of plastic tubing and, most important, two steel smoke nozzles that can be adjusted for the best results. The system is very easy to install, and you can place it anywhere in the fuselage.

I installed this smoke system in my BVM Kingcat. During the system test, I used MDW Aviation Associates' (mdw-aviation.com) Super Dri aviation smoke oil; it's the same stuff as that used in full-size aircraft. The only thing you'll have to buy is a tank to hold the smoke oil! Everything else you'll need is included in the package.

To operate the system, I plugged it into an auxiliary channel on my transmitter; to turn the smoke on and off, all I have to do is flip a switch. The pump's flow rate can be set from 0 to 150 percent on your transmitter, so you can determine the rate that produces the best smoke volume with the least amount of oil. Less oil used per minute means longer smoke-on time. Depending on the engine you use and the exhaust setup (internal or external), you will have to do some experimenting to dial in the system. In my setup, the Tamjets system produces such beautiful, dense smoke that I just wanted to continue increasing the flow rate. The downside of this is, of course, the amount of smoke oil you must carry on board. As a guide, the estimated flow rate at the 150-percent setting is approximately 20 ounces per minute.

As you can see, the smoke trail is very noticeable, and it has a nice hang time. The big difference between smoke from a turbine and smoke from a gasoline engine is that the turbine can make smoke all the time! From idle to full power, the exhaust temperature of a turbine is high enough to give you gobs of smoke! Gasoline engines do their best only when at full power. With this in mind, you'll have to plan your smoke-on time for maximum results. For example, I use the system only during large vertical maneuvers, and I turn it off as I exit the maneuver. If you keep the switch on all the time, you'll be out of oil in no time.

click trip MODELAIRPLANENEWS.COM SEE VIDEO OF THE SMOKE SYSTEM IN ACTION!

Priced at $195, the Tamjets TJ5 Smoke System is easy to install, and it works every time. Smoke is a great way to add excitement and realism to your turbine- and gas-powered models. Smoke on!

—Dave Malchione

Tamjets (408) 224-7600; tamjets.com.

Du-Bro

Fillin' Station

Leave that big, heavy flight box in the pits!

Du-Bro is well-known for its high-quality and innovative products, and the Fillin' Station is no exception. This useful product holds a number of necessary flightline tools and gives you easy access to all of them. The Fillin' Station fits on a standard-size, plastic, glow-fuel 1-gallon jug and creates an airtight, leakproof seal. A small bracket assembly sits on top of the fuel bottle, and it has a fast, Kwik-Fill hand-fill fuel pump mounted to it. The pump is connected to the pick-up tube and fuel line (silicone fuel tubing is included), and the fuel cap has an aluminum nozzle that fits the Du-Bro fueling valves. Need to fuel gasoline-powered models? Just use Tygon tubing instead of the silicone line; everything else is compatible with gasoline.

The Fillin' Station has a built-in tool holder with room for screwdrivers, hex drivers and other tools as well as a 4-way wrench (which is included). If you're on the flightline with your Fillin' Station and your glow plug dies, there's no need to worry because two anodized glow-plug holders are mounted right on the Fillin' Station. Of course, you'll need a way to ignite the glow plug, so hanging on the Fillin' Station is a Kwik Start glow-plug igniter housed in a Glo-Caddy. The Glo-Caddy can hang on the Fillin' Station or be clipped onto your belt. A wall charger is included for the Kwik Start glow-plug igniter.

The Fillin' Station is perfect for modelers who want to have all the necessary tools needed to start a plane in one easy-to-carry package. Price: $64.95. *—John Reid*

Du-Bro Products (800) 848-9411; dubro.com.

Classic Model Airplane News

by Matt Boyd

50 years ago ...

... this month, Jo Kotula depicted one of the most feared and respected fighters of WW I—the Fokker DVII. With its fully cantilevered wings and steel-tube frame, the DVII was amazingly robust. In fact, the wing supported itself without the need for interplane struts, but conservative authorities of the day required that they be added for cosmetic reassurance.

... *Model Airplane News* reviewed K&B's Torpedo .35 engine. Author E.C. Martin remarked that the Torpedo .35 was an "... outstanding modern engine ... a balanced design ... refined to the last detail." It marked a steady movement upwards in displacement, approaching the .40oci class that is now the standard.

... we ran a 2-page pictorial spread showcasing just a few of the 5,000 planes that took to the air at the 1954 Nationals. All sizes and styles were represented, from immaculate scale jobs to oddball, forward-thinking designs.

... a dramatic red Lockheed Orion led off our coverage of the 1979 Nationals held in Lincoln, NE. Indeed, the November issue could rightly be described as the "Nationals issue" because there were no fewer than seven articles on aspects of the U.S. event, the Canadian Nationals and even a national boat event.

... we took a look back at a true classic from 1949: Walt Good's Rudder Bug. In one of our "golden oldies" series of articles, we revisited this classic flyer, which was originally designed for a 30-size nitro engine. In our January '04 issue, Nick Ziroli published a thoroughly updated and reworked version for electric power.

... for the motorheads, Peter Chinn put together another engine roundup featuring an O.S. Max 61VF, a SuperTigre G.60BH, a Webra Speed 91 and a Como 40. As always, Peter thoroughly covered all engines both from the technical and practical standpoints.

25 years ago ...

... the distinctive shape of Kress Jets' electric-powered P-38 Lightning graced the cover of the November 1994 issue. With a span of just 48 inches and many molded-plastic and foam parts, this kit was a glimpse into the future of lightweight electric modeling.

... we heralded the expansion of modeling into the Internet age by directing our readers to online RC resources; now, it's a staple of virtually every article we do. Can you even conceive of a modeling company or group that doesn't have some connection to the Web? How quickly times change....

... veteran modeler, designer and purveyor of aeronautical knowledge Andy Lennon showed how to construct the Dove—a 78-inch, powered glider suitable for relaxed cruising and soaring. The model is rugged and light and flew beautifully, just as you would expect of a plane designed by someone with Andy's modeling expertise.

10 years ago ...

CLASSIFIEDS

RATES: non-commercial—25 cents per word (no commercial ads of any kind accepted at this rate); commercial—50 cents per word (applies to retailers, manufacturers, etc.); count all initials, numbers, name and address, city, state, zip code and phone number. **All ads must be paid for in advance.** To run your ad for more than one month, multiply your payment by the number of months you want it to run. Deadline: the 10th day of the month, 3 months in advance, e.g., *January 10 for the April issue.* We don't furnish box numbers, and it isn't our policy to send tear sheets. Please make all checks payable to: **AIR AGE INC. SEND AD AND PAYMENT TO: CLASSIFIED ADS, *Model Airplane News*, 100 E. Ridge, Ridgefield, CT 06877-4606 USA, or call (203) 431-9000.**

BUSINESS

AG-AIRCRAFT PLANS. Pawnee, Agwagon, Pawnee Brave, Transavia Airtruk/Skyfarmer, Fletcher FU-24, Cropmaster and more. Hardware paks, colour photo paks, free documentation. Catalogue/Price list: $5 (U.S.); VISA/MC. New Zealand Aero Products, 34 Ward Parade, Stirling Point, Bluff. New Zealand. Mobile: +6427-427-1843. [5/05]

CUSTOM LASER-CUT KITS AND PARTS: We can precision laser-cut balsa, plywood and plastic parts and kits for your AutoCad, CorelDraw or Adobe Illustrator files or design it for you. We have the latest computer-controlled equipment. Artwork-scanning service is also available. Competitive prices and fast order turn around. Ohio Laser Engraving, 4986 W. Enon Rd., Fairborn, OH 45324; (937) 878-5587. Visit our website at: ohlaser.com. Email: support@ohlaser.com. [12/04]

WANTED: UNIMAT AND WATCHMAKER LATHES; early microprocessors: KIMs; SYMs; AIMs; SOLs; robots and Atmos clocks. John Rawley 1923 Susquehanna, Abington, PA 19001; (215) 884-9220; johnR750@aol.com. [6/05]

CUSTOM VINYL RC DECALS AND GRAPHICS, *Economical, RC-Decals.com;* RC-Decals, P.O. Box 690451, Charlotte, NC 28227. [12/04]

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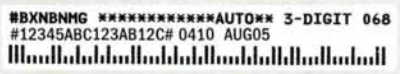

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MODEL AIRPLANE NEWS (USPS 533-470; ISSN 0026-7295) is published monthly by Air Age Inc., 100 East Ridge, Ridgefield, CT 06877-4606 USA.

Periodicals postage permit paid at Ridgefield, CT and additional offices. Canadian Post Publications Mail Agreement No. 40008153.

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BY GERRY YARRISH

Boeing Model 377 Stratocruiser

Giant cruiser of the skies

specifications

WINGSPAN: 180 in.
LENGTH: 141 in.
WEIGHT: 84 lb. (special AMA waiver)
ENGINES: 4 Zenoah G-26s

When Carl Bachhuber of Mayville, WI, sets out to build a big model, he doesn't fool around! To him, bigger really is better—and the more engines the better, as well! When I arrived at the 2004 IMAA "Warbirds over Delaware" meet this past July, I thought I was seeing things and said to myself, "Surely that can't be what I think it is"—but it was. Sitting in the middle of the pit area was a big, beautiful, very shiny Boeing Model 377 Stratocruiser! With its 180-inch wingspan, it made most of the other models at this giant-scale meet look small.

First flown on May 6, 2004, at the Fond du Lac (WI) flying club field, Carl's Stratocruiser took seven months to complete, and that includes the time it took to produce the working drawings using ModelCAD software. Carl used very traditional methods to produce the mammoth airliner, and it includes balsa, plywood and lite-ply formers, stringers and ribs. The entire model is sheeted with balsa and finished with 0.7-ounce fiberglass cloth and epoxy resin. Carl made the striking aluminum finish out of self-adhesive, polyester Mylar tape sheets used in the magnetic-tape recording industry. The various panels were then scuffed with Scotch-Brite pads to produce a scale finish.

The engines propelling the Model 377 are four Zenoah G-26s turning 3-blade props.

To make it easier to transport, Carl wisely included plug-in wing panels with large carry-through tubes at both the front and rear spars. The tubes run out to the inboard engine nacelles and provide the necessary strength to withstand landing forces taken up by the nacelle-mounted gear. The custom retracts are homegrown, and Carl used Robart air cylinders to actuate the impressive-looking struts.

Carl uses a Futaba 9CAP radio system to control a total of 14 servos. These include four to drive the Fowler-style flaps, four for throttle, one for each elevator half, rudder, nose-gear steering, brakes and the retracts' pneumatic control valve. Access to the various radio switches and air-charging valves is through the scale crew entry door. Inside the flight deck are the pilot and copilot figures and a nicely detailed main office.

Dwarfing many of the models at the Delaware Warbirds meet, this Boeing Model 377 Stratocruiser is a giant among giants!

Carl reports that his first flight took off in about 100 to 150 feet after a very short taxi test and required only two clicks of downtrim. By the time the model had reached the halfway point of the first lap, it flew hands off! The Stratocruiser handles very well at low- and high-throttle settings, but Carl admits that he needs more landing experience. The gear has held up surprisingly well, but after seeing Carl—who has more than 40 years of RC experience—fly and land his Model 377, I know he's only being modest about his piloting skills!

The aluminum finish is brilliant in the noontime sun. It was applied panel by panel and then burnished for an authentic scale look.

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The original aircraft was a Northwest Airlines plane that was in service during the late 1940s through about 1955. The aircraft owes much of its design to the Boeing B-29 and the later B-50 variant of the Superfortress. The design was also used as a military cargo aircraft (C-97) and as an airborne tanker (KC-97). In the late 1950s, the Model 377 was replaced by the Boeing 707.

For more information and photos of Carl's Stratocruiser (as well as his many other gigantic model aircraft), check out his website at carlb-rcplanes.com. He also welcomes email and can be reached at carlb@mayvl.com. ±